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15.ª Reunião Anual da APIC 2024

PRÉMIO JOVEM CARDIOLOGISTA DE INTERVENÇÃO

Casos Clínicos

Desafios em Intervenção Coronária & Estrutural

A toda a Cardiologia Portuguesa,

Em 2024 encontramo-nos na 15.ª Reunião Anual da APIC.

Neste evento, partilhado por diferentes profissionais que abraçam a Cardiologia de Intervenção no seu quotidiano, debatemos os temas mais relevantes da atualidade desta atividade. Fazemo-lo sem esquecer o passado, recordando e celebrando, neste momento, efemérides marcantes para todos, como 15 anos de APIC, 25 anos de Via Verde Coronária e 40 anos de Angioplastia em Portugal. Não obstante, estamos também voltados para o futuro, estando a inovação espelhada no alinhamento do nosso programa científico.

Este suplemento, é também por si o nascimento de uma iniciativa que complementa a tradição dos casos clínicos apresentados nas Reuniões da APIC. Acreditamos que será determinante para o registo e memória futura dos casos de elevada qualidade partilhados entre nós, elevando exponencialmente o potencial didático dos mesmos.

Convicto de que a edição deste suplemento será por todos valorizada, tenho confiança na sua renovação nas Reuniões subsequentes e que possa, no futuro, vir a ser também uma efeméride celebrada.

Pedro Jerónimo de Sousa
Presidente da 15.ª Reunião Anual da APIC

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15th Annual Meeting of APIC 2024

YOUNG INTERVENTIONAL CARDIOLOGIST AWARD

Clinical Cases

Challenges in Coronary & Structural Intervention

To all of the Portuguese cardiology community:

In 2024 we met at the 15th Annual Meeting of APIC.

At that event, shared by medical professionals of different kinds who are involved day-to-day in interventional cardiology, we debated the most important aspects of current practice in this field. We did so without ignoring the past: we remembered and celebrated milestones that are significant for all of us, including 15 years of APIC, 25 years of the coronary fast-track system (*Via Verde Coronária*), and 40 years of angioplasty in Portugal. At the same time, we are also focused on the future: our emphasis on innovation is reflected in the content of our scientific program.

This Supplement itself represents the birth of an initiative that will add to the tradition of presenting high-quality case studies at APIC Meetings. We believe that recording the case studies shared by participants at the Meeting in this way and making them accessible in the future will significantly enhance their didactic value.

I am certain that the publication of this Supplement will be greatly appreciated by all concerned, and am confident that it will be repeated after future APIC Meetings – making it yet another milestone to be celebrated.

Pedro Jerónimo de Sousa
President of the 15th Annual Meeting of APIC

Revista Portuguesa de Cardiologia 44 (2025) S3-S27

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COMUNICAÇÕES

15.ª Reunião Anual da APIC

7 a 9 de Novembro de 2024

1. OVERCOMING THROMBUS CHALLENGES: PENUMBRA SYSTEM MEETS GUIDELINER

Francisco Barbas de Albuquerque, Tiago Mendonça, Luís Morais

Centro Hospitalar Universitário de Lisboa Central, EPE/Hospital de Santa Marta, Lisboa, Portugal

A 65-year-old man with a past medical history of hypertension, dyslipidemia and former smoker, presented to the emergency department with episodes of chest pain at rest in the past 48-hour. Physical examination was unremarkable except for blood pressure of 181/110 mmHg. Electrocardiogram revealed T wave inversion at DII, DIII and aVF leads. High sensitivity troponin T raised from 2,330 ng/dL to 4,867 ng/dL at 3-hour serial measurement. Non-ST segment elevation myocardial infarction (MI) diagnosis was established, and the patient was transferred for percutaneous coronary intervention (PCI).

Right radial artery (RRA) access was used for diagnostic angiography. Figure 1A shows no significant lesions in the left coronary artery. Figure 1B shows the middle segment of right coronary artery (RCA) occluded with significant thrombus burden.

Right femoral artery access and an Amplatz-left 1 7F intervention catheter were chosen to provide support for the intervention. A Runtrough™ guidewire failed to cross the occlusion, which was subsequently crossed with a Sion® Black through a Finecross™ microcatheter. A diagnostic catheter through the RRA was used for dual injection and confirmed true lumen crossing (Figure 1C).

Given the high thrombotic burden, we performed multiple thrombus aspirations (1) using several aspiration catheters (Eliminate™ 7F, Capturer 7F, Export AP 6F) with both 30 and 50 cc syringes, resulting in partial success (Figure 1D). Balloon angioplasty with 2 and 2.5 mm SC balloons was performed aiming to fragment the thrombus and facilitate its removal. Nevertheless, a significant amount of thrombus remained in the vessel (Figure 1E). Subsequently, we advanced a Guideliner® V3 7F catheter through "inchworm" technique to reach the distal vessel and attempted an active negative aspiration through the catheter using a 50 cc syringe (Figure 1F).

Given that substantial thrombus persisted in the distal RCA (Figure 1G) we performed one last aspiration attempt using the penumbra system. Penumbra Aspiration System® was directly connected the Y-connector (Figure 1H and 1I) and an aspiration was conducted through the Guideliner® V3 7F catheter positioned in the distal RCA and gradually retracted to the guiding catheter. During retraction of the catheters, we maintained continuous active suction to minimize the risk of embolization. This technique resulted in successful extraction of a 2.2 cm thrombus (Figure 1J). The thrombus occluded the 7F guiding catheter which had to be removed and flushed. No arrythmia was observed during suction.

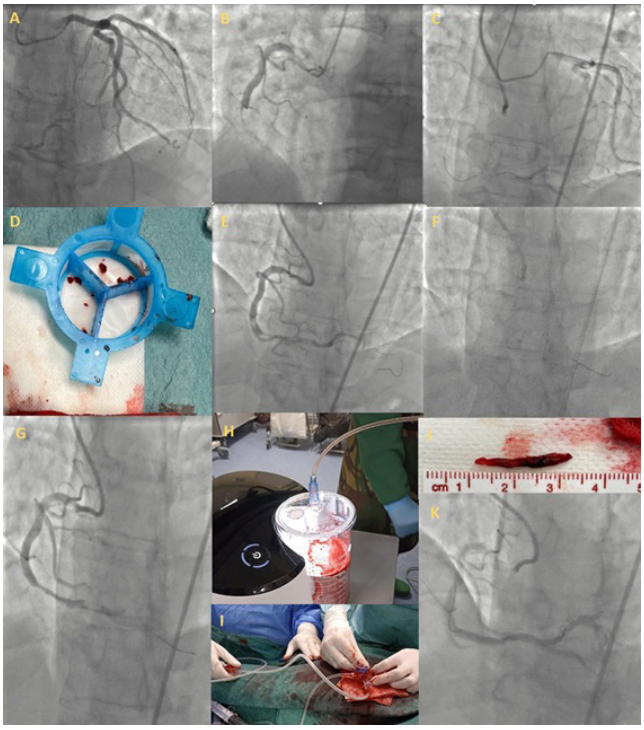

Figure 1. *A-left coronary angiography,* ***B****-right coronary angiography,* ***C****-dual injection to confirm true lumen crossing,* ***D****-thrombus after multiple aspirations,* ***E****-persistence of thrombus,* ***F****-Guideliner catheter for 50 cc syringe aspiration,* ***G****- thrombus located at distal right coronary,* ***H****-Penumbra aspiration system,* ***I****- Penumbra system connected to Y-connector,* ***J****- 2.2 cm thrombus,* ***K****- final angiographic result*

We then performed intravascular ultrasound which did not show any intra-coronary injury. Appropriate measurement of the vessel was performed and a 4.5 × 23 mm drug-eluting stent was directly implanted. The final result is illustrated in figure 1 K.

Current guidelines on acute coronary syndrome do not recommend routine PCI of occluded infarct-related artery (IRA) after 48h of symptoms onset[1]. Nevertheless, our patient remained with recurrent episodes of chest pain at rest, refractory to medical therapy. In addition, transthoracic echocardiography showed preserved left ventricle systolic function and

only mild hypokinesia of meso-basal segment of the inferior wall. Given the clinical scenario and potentially viable myocardium in the IRA territory, we considered beneficial to perform PCI despite the late symptom presentation.
We also acknowledge routine thrombectomy is currently a class III recommendation in guidelines, as large trials failed to show clinical benefit with thrombus aspiration compared to PCI alone[1]. Still, in an individual patient data meta-analysis, fewer CV deaths were observed with thrombus aspiration in patients presenting with high thrombotic burden[2]. Also, the operators stated that a thrombotic burden as high as the one observed in our case, would carry a major risk of no-reflow, and consequently, more infarcted related area, if no thrombectomy was performed.
So, in clinical scenarios where high thrombus burden is observed, as was our patients', it may still be useful to perform coronary thrombectomy. Additionally, as strokes are major drawback from aspiration, we used a 7 FR Guideliner to prevent cerebral embolic complications.
This case highlights a challenging high thrombotic burden MI, successfully managed with thrombectomy using the Penumbra Aspiration system® connected to Guideliner® V3 7F catheter. To the best of our knowledge, this is the first case demonstrating this innovative approach.

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2. RIGHT VENTRICLE OUTFLOW TRACT STENTING: A PALLIATIVE STRATEGY FOR TETRALOGY OF FALLOT

Catarina M. Almeida, João Carlos Silva, Jorge Moreira

Centro Hospitalar Universitário de S. João, EPE, Porto, Portugal

As intervenções percutâneas na câmara de saída do ventrículo direito (CSVD), na qual se inclui o stent na CSVD, são uma estratégia paliativa alternativa ao shunt sistémico-pulmonar (SSP) por cirurgia nos recém-nascidos com Tetralogia de Fallot (TOF) e cianose, permitindo um alívio da obstrução infundibular com manutenção de um fluxo pulsado para as artérias pulmonares e o seu crescimento, quando comparadas com o SSP, associado a morbilidade e mortalidade significativa.
Apresentamos um recém-nascido de termo com 2.950 gramas e diagnóstico pré-natal de TOF. Ao ecocardiograma transtorácico no segundo dia de vida confirmada anatomia de TOF com comunicação interventricular perimembranosa grande, cavalgamento do septo interventricular de cerca de 50%, hipoplasia da válvula e tronco (TP) e ramos pulmonares. Associadamente obstrução de fluxo na CSVD desde a região infundibular com gradiente máximo de 70 mmHg.
Nos primeiros dias de vida apresentou vários episódios de dessaturação com saturações periféricas de oxigénio (SpO_2) 65-75% com reversão espontânea, tendo iniciado propranolol por via oral. O angioTC em D5 de vida mostrou ventrículo direito hipertrófico com infundíbulo da CSVD muscularizado, com calibre mínimo de 4 mm, TP com 3,5 mm (z-score -2,7), artéria pulmonar direita (APD) com calibre regular de 3,8 mm (z-score -1,8), estenose na origem da artéria pulmonar esquerda (APE) de 3,2 mm (z-score -2,6) e diâmetro distal de 4 mm (z-score -0,8).
Por manutenção do estado clínico decidiu-se avançar com a estratégia paliativa de implantação percutânea de stent na CSVD. Em D21 de vida realizou cateterismo cardíaco, por via femoral direita. A angiografia em lateral no ventrículo direito mostrou uma estenose infundibular significativa com estreitamento crítico do infundíbulo durante a sístole (Figura 1A). As medições efetuadas revelaram um anel pulmonar de 4,3 mm e tronco pulmonar de 4,7 mm. Procedeu-se à implantação de stent Onyx Frontier 4,5 × 18 mm (expansão a 16 atmosferas), confirmando-se posição ligeiramente distal. Por este motivo foi implantado um segundo stent mais curto em sobreposição parcial (expansão a 16 atmosferas - Figura 1B). A angiografia de controlo mostrou CSVD uniforme de 4,8 mm, preenchida pelos dois stents implantados, sem aparentes zonas de estenose (Figura 1C). As SpO_2 no início do procedimento eram cerca de 70%, com subida para 88% no fim da intervenção. O doente iniciou ácido acetilsalicílico (15 mg id) na manhã seguinte apresentando boa evolução clínica com alta para o domicílio 6 dias após cateterismo.

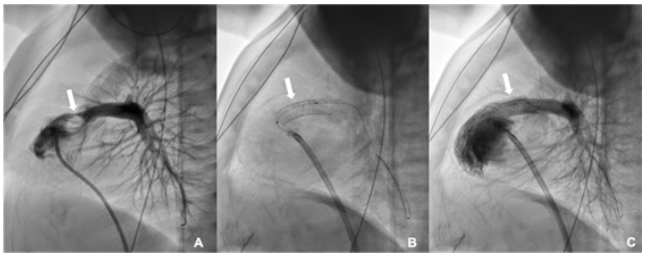

Figura 1. *A-estreitamento crítico do infundíbulo do VD; B-colocação do segundo stent na CSVD; C-angiografia final.*

Avaliado em consulta aos 36 dias de vida, apresentando um bom estado geral, com SpO_2 de 100%. Visualizados stents no TSVD no ecocardiograma transtorácico com fluxo turbulento. Realizado angioTC 9 meses após intervenção percutânea que mostrou os dois stents no infundíbulo do ventrículo direito, com calibre regular de cerca de 4 mm e sem fraturas, um TP de calibre normal (9,5 mm, z-score -1,7), bem como artérias pulmonares confluentes com calibre normal e regular (APD de 9,3 mm, z-score +0,7, e APE de 9,1 mm, z-score +0,4). Submetido a correção cirúrgica aos 12 meses.

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3. STEMI WITH A HIDDEN AGENDA

Mónica Dias, Carla Ferreira, Inês Conde, Filipe Vilela, Rodrigo Silva, Sofia Fernandes, Rui Flores, Carla Marques Pires, Carlos Galvão Braga, Catarina Quina Rodrigues

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Introduction: Septic coronary embolization secondary to infective endocarditis (EI) is a rare cause of type 2 acute myocardial infarction (AMI)[1]. Diagnosis of septic coronary embolism in the setting of ST-segment elevation myocardial infarction (STEMI) requires a high level of suspicion for IE and often involves multi-modality imaging. Appropriate management of septic coronary embolism is not standardized and evidence regarding the best strategy is lacking.
Case report: A 65-year-old woman presented to the emergency department with one hour of chest pain. Her medical history included hypertension, type 2 diabetes mellitus, dyslipidemia, and aortic valve replacement with a biological prosthesis nine months earlier. On admission, a 12-lead electrocardiogram revealed ST-segment elevation in the inferior leads, leading to promptly referral for immediate angiography. Catheterization of the left main coronary artery proved technically challenging, and a rocking motion of the aortic prosthesis raised suspicion of aortic dissection. Aortography showed no evidence of aortic regurgitation, but possible dissection of the left coronary sinus, while coronary angiography revealed acute occlusion of the distal circumflex coronary artery (Cx). Initial attempts at thrombus aspiration during primary percutaneous coronary intervention (PCI) failed, and reperfusion was achieved only after balloon angioplasty. Chest-computed tomography angiography (CTA) was performed and ruled out aortic dissection but revealed abnormal parietal thickening of the aortic root. Transesophageal echocardiogram (TEE) was then performed and strongly suggested prosthetic valve endocarditis (PVE) complicated by

a large pseudoaneurysm, with an oscillating movement of the prosthesis. Empirical treatment with vancomycin and gentamicin was initiated. Laboratory investigations revealed a slightly elevated troponin I, along with elevated inflammatory markers. Blood cultures later returned positive for multi-sensitive *Staphylococcus warneri*, confirming early PVE[2]. The patient was referred for urgent surgical intervention, but the surgical risk was deemed prohibitive, so the patient was managed conservatively. The patient succumbed to uncontrolled infection two weeks later.

***Figure 1**. Cardiac catheterization of the left main coronary artery with contrast leakage into an aortic recess suggesting aortic dissection vs pseudoaneurysm, and acute occlusion of circumflex artery.*

***Figure 2**. Chest CTA (short axis view) with abnormal parietal thickening of the aortic root (*). LA - left atrium; RA - right atrium; RVOT - right ventricular outflow tract.*

Discussion: AMI is a rare but serious manifestation of IE. Septic coronary emboli should be suspected in patients with prosthetic heart valves, especially in the absence of coronary atherosclerotic disease. In the event of a STEMI, reperfusion strategy is recommended[3]. Consequently, our patient was promptly referred for immediate angiography. Despite procedural difficulties raising concerns about aortic pathology, coronary angiography confirmed acute occlusion of the distal Cx. Given the high suspicion for septic embolization and potential for urgent surgery, aspiration embolectomy and ballon angioplasty were preferred over stenting. Chest CTA ruled out aortic dissection, while TEE confirmed PVE complicated by a large pseudoaneurysm. AMI in the setting of IE typically occurs early in the disease course, often associated with virulent microorganisms, aortic valve involvement and periannular complications[4]. The increasing prevalence of prosthetic devices has increased the importance of coagulase-negative staphylococci as a cause of PVE, but *S. warneri* remains a rare cause of endocarditis[5]. Diagnosing IE in patients with prosthetic valves can be particularly challenging and often requires a multi-modality imaging approach. Despite advances in medical therapy, the prognosis remains poor for patients who are not eligible for surgery, underscoring the need for timely diagnosis and intervention.

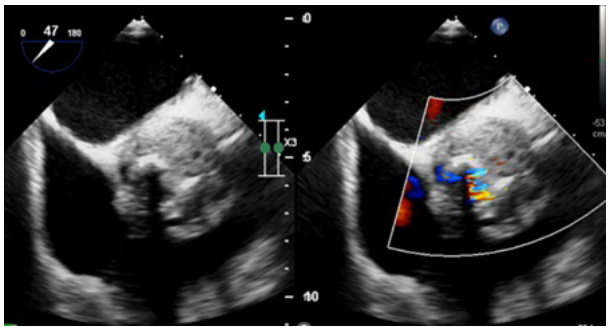

***Figure 3**. Transesophageal echocardiogram: midesophageal aortic valve short axis-view showing prosthetic valve endocarditis complicated by a large pseudoaneurysm involving two-thirds of the prosthetic circumference.*

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4. A HOLY SITUATION: AN UNEXPECTED COMPLICATION DURING A TAVI PROCEDURE

Inês Ferreira Neves, Tiago Mendonça, Ruben Ramos

Centro Hospitalar Universitário de Lisboa Central, EPE/Hospital de Santa Marta, Lisboa, Portugal

An 86-year-old male patient underwent transcatheter aortic valve implantation (TAVI) for severe aortic stenosis, presenting with syncope. His past medical history was relevant for dyslipidemia, Right Bundle Branch Block, Chronic Kidney Disease and peripheral artery disease.
The assessment performed previously to the procedure included an echocardiography showing a peak velocity in aortic valve of 5 m/s, with mean pressure gradient of 69 mmHg and an area of valve of 0.95 cm^2; and a computerized tomography (CT) scan demonstrating a tricuspid aortic valve of 24.9 mm diameter according to 78.2 mm perimeter of aortic annulus. The valvular calcium score was 3,645, with a valvular area of 0.8 cm^2. A severe calcification of the aortic arch was also noted in the CT scan (Figure 1).
A SAPIEN 3 ULTRA 26 mm was implanted. Pre-dilation was performed with a valve balloon dilated to 22 mm. After the implantation of the valve, a moderate residual leak was noted. A post-dilation with the same balloon was attempted, with difficulty with balloon progression. At this time, the patient presented with haemodynamic collapse and cardiac arrest. Echocardiogram showed no pericardial effusion, excluding annular rupture, and the coronary arteries were patent. While performing advanced life support maneuvers, an aortography was performed, revealing a rupture at the transition between the aortic arch and the descending aorta (Figure 2). A tamponade with a 28 mm balloon was performed and a TEVAR 28 mm was implanted with subsequent dilation using a RELIANT balloon. While resolution of the active rupture was achieved angiographically (Figure 3), and despite 55 minutes of resuscitation maneuvers, cardiac rhythm could not be restored.

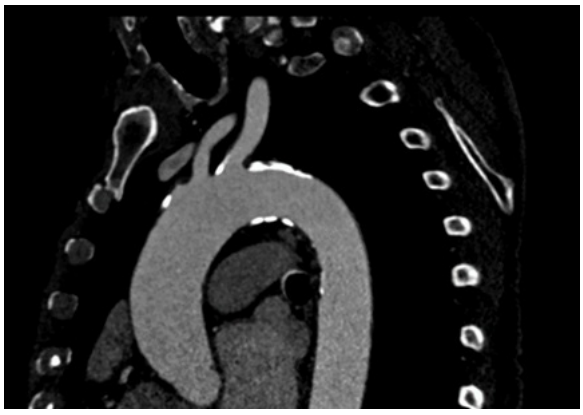

Figure 1.

Figure 2.

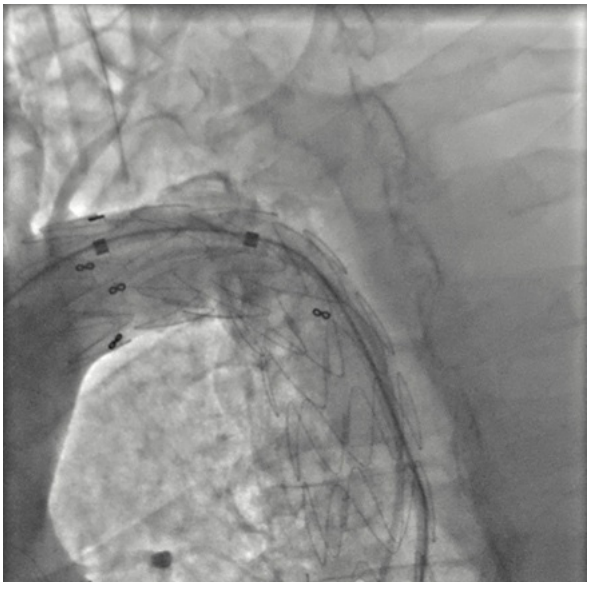

Figure 3.

Aortic rupture is a rare complication of TAVI, occurring in less than 1% of the procedures, but it is generally catastrophic. Rupture can occur from puncture of the aorta by the delivery catheter when trying to advance around an acute angulation in a tortuous aorta. A high level of suspicion is needed, and the diagnosis should be considered in any patient undergoing TAVI who experiences hemodynamic instability. It is a life-threatening complication, as it causes rapid onset of hemorrhagic shock. Management options include surgical or endovascular repair (with covered stent grafts). Despite appropriate interventions, mortality remains high.

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5. BAILOUT COILING DURING M-TEER

Mafalda Griné, Manuel Oliveira-Santos, Luís Paiva, José Luís Martins, Ana Botelho, Marco Costa, Lino Gonçalves

Centro Hospitalar e Universitário de Coimbra, EPE/Hospitais da Universidade de Coimbra, Coimbra, Portugal

An 81-year-old-man was referred to our heart valve clinic due to symptomatic heart failure (HF) with severe mitral regurgitation despite guideline-directed medical therapy, including two HF hospitalizations within the past year. Transoesophageal echocardiogram (TOE) revealed posterior leaflet tethering with anterior leaflet pseudoprolapse resulting in two jets (A1/P1 and A2/P2). After Heart Team discussion, the patient was referred for mitral transcatheter edge-to-edge repair using the PASCAL® system (Edwards Lifesciences, California, United States of America). Transseptal puncture was done under angiographic and TOE guidance. Following successful septum crossing and guide sheath placement within the left atrium, we were unable to remove the stiff wire, which was found to be wedged in a pulmonary vein branch (Figure 1). A 5-Fr multipurpose (MP) catheter was advanced over the wire to increase support, without success. Then, a 125 cm 5-Fr MP catheter mounted on an 8-Fr JR4 guiding catheter was advanced in a *mother-in-child* configuration, allowing for selective angiography. After several attempts, a forceful manual pullback was able to dislodge the wire, resulting in vessel perforation and active bleeding (Figure 2). Bailout coil embolization was performed. A 0,018'' AZUR® Peripheral Hydrocoil Embolization System (Terumo, Tokyo, Japan) was loaded into the dedicated PROGREAT® microcatheter (Terumo), which was advanced through the 5-Fr MP catheter and positioned in the distal vessel. Subsequently, the coil was successfully deployed and detached after confirming its position and lack of further bleeding with fluoroscopy (Figure 3). The patient remained hemodynamically stable throughout the procedure. Nonetheless, the mitral valve procedure was postponed. Protamine and later tranexamic acid were administered. Control computed tomography angiography confirmed the absence of active bleeding. Prophylactic antibiotic therapy was instituted (Amoxicillin/Clavulanate) along with chest physiotherapy and kinetic therapy.

During the hospital stay, the patient remained hemodynamically stable and did not require transfusion support. However, he developed signs of volume overload and required a short course of non-invasive positive pressure ventilation and intravenous diuretics, with resolution of symptoms and respiratory insufficiency. Oral anticoagulation was successfully restarted on day 10 and the patient was discharged 48 hours later.

To the best of our knowledge, this is the first report of a pulmonary vein branch rupture during M-TEER and its successful management. Careful wire positioning and revaluation at each step is paramount to prevent complications. Nevertheless, wire entrapment may still occur. In this case, anticipation of possible vessel perforation during removal was key to define, prepare and promptly deploy haemostatic measures. Coil embolization proved feasible and effective in this scenario.

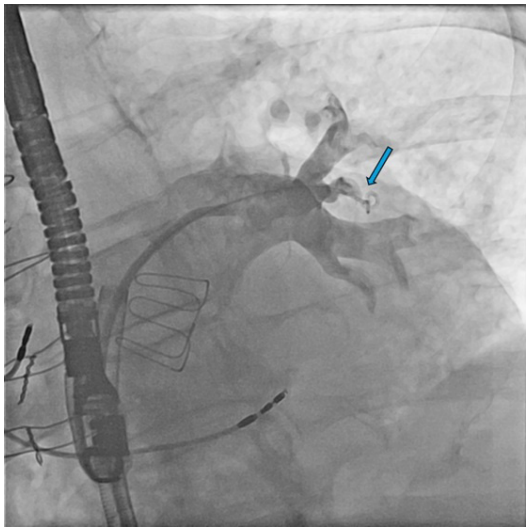

***Figure 1**. Stiff wire entrapment in a pulmonary vein branch (blue arrow).*

***Figure 2**. Pulmonary vein rupture (blue arrow).*

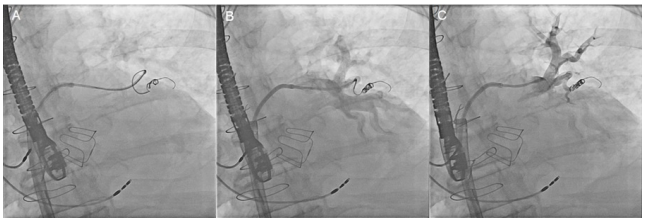

***Figure 3**. Coil embolization procedural steps. (A) Microcatheter positioning and coil deployment. (B) Position confirmation before detachment. (C) Final Result (complete seal).*

6. PULMONARY ARTERY DENERVATION - A CASE OF IMMEDIATE SUCCESS

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This is a clinical case of a 67-year-old female, with multiple cardiovascular risk factors, namely hypertension, type 2 Diabetes mellitus, dyslipidaemia and obesity. The patient had a past medical history of a HFpEF due to rheumatic mitral valve disease, permanent atrial fibrillation, for which she had a AV node ablation and a VVIR pacemaker implantation in 2018, and an ischemic stroke in 2015. Her daily medication was acenocoumarol; dapagliflozin 10 mg; furosemide 40 mg; lisinopril 5 mg; carvedilol 25 mg; liraglutide 60 mg and atorvastatin 40 mg + ezetimibe 10 mg. Her last medical exams performed were a TTE that showed a non-dilated LV chamber with preserved EF, rheumatic mitral valve causing moderate mitral regurgitation and a PSAP 52 mmHg; and an exercise echo from the same year showing an increase in RV-RA gradient from 21 to 40 mmHg in the first 20 seconds. The patient also had performed a coronary catheterization in 2023, with non-obstructive coronary artery disease. She presented in a cardiology consultation in NYHA III, with complaints of worsening fatigue, exertional dyspnea and lower limb edema.

Initial Workup: Due to patient's complaints, a new TTE was performed, showing rheumatic mitral valve, with an anatomic area of 2.7 cm^2, mean gradient 5 mmHg and mild regurgitation. RV-RA gradient 38 mmHg; PSAP 46 mmHg. TEI índex 0.32. Severe pulmonary regurgitation (EROA 0.52 cm^2, regurgitant volume 80 mL), with PA dilation (48 mm). Non-dilated LV with mild hypertrophy and preserved EF. Atrial dilatation. Mildly dilated RV, with preserved longitudinal function. NT-ProBNP 4,499 pg/mL and 6 MWD 138 m. Right heart catheterization (RHC) was performed and the results were: mPAP 34 mmHg; PCWP 20 mmHg and PVR 2.99 WU, compatible with CpcPH. The patient met the all the criteria for inclusion in the PADN-CpcPH-PILOT Study, and did not meet any of the exclusion criteria. The study was proposed and explained to the patient, who understood the procedure and signed the informed consent to participate.

A pre-procedure RHC was performed and then a multi-pole pulmonary artery RF ablation catheter was placed in the ostial left pulmonary artery and three applications of RF were performed. Finally, after the procedure, another RHC was performed, showing a reduction in mPAP from 25 to 19 mmHg (pre-PADN to post-PADN, respectively), in PVR from 2.19 to 1.26 WU, and in PCWP from 14 to 12 mmHg. Also, CO and CI increased after the procedure (5.03 to 5.56 L/min and 2.48 to 2.74 L/min/m^2, respectively).

In the first medical visit (30 days after PADN, the patient reported significant improvement in daily activities, with less fatigue and better functional capacity (NYHA I). Physical examination showed normal lung and heart auscultation and no peripheral edema. This case reports immediate and short-term follow-up success of PADN, which can be a promising treatment strategy in patients with a disease that, nowadays, is extremely difficult to treat due to the lack of benefit of current treatment options. However, long-term follow-up (at one year) must be performed to understand the effective benefit of this novel therapeutic option.

7. SOLVING THE KNOT - SUCCESSFUL MANAGEMENT OF CATHETER LOOP FORMATION USING "MOTHER-AND-CHILD" TECHNIQUE

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Case report: A 77-year-old female patient was referred for coronary angiography as part of the pre-surgical evaluation for severe primary mitral regurgitation. Her medical history included arterial hypertension, permanent atrial fibrillation, and a total hysterectomy with bilateral salpingo-oophorectomy performed 25 years earlier. Her current medications included candesartan 8 mg once daily, furosemide 40 mg twice daily, edoxaban 60 mg once daily, and bisoprolol 10 mg once daily. The coronary angiography was attempted via the left radial artery after a failed attempt through the right radial artery, where the guidewire could not progress through the introducer. A 6Fr (French) radial sheath was introduced into the left radial artery and a 5Fr TIG (Tiger) catheter was used for left coronary angiogram, which was free of any significant stenotic lesions. However, during the attempt to catheterize the right coronary artery (RCA),

the guidewire failed to advance due to a loop formation in the catheter at the level of the patient's left elbow (Figure 1). Attempts to straighten the kink with an exchanging guidewire and a hydrophilic guidewire were unsuccessful, as was the use of an angioplasty guidewire. At this point, it was decided to catheterize the right femoral artery using a 7Fr catheter in an attempt to remove the catheter anterogradely. Using an *EnSnare* device, the tip of the TIG catheter was successfully inserted inside a 7Fr JR4 catheter (Figure 2) using the "mother-and-child" technique, whereby the larger catheter was advanced within the smaller TIG catheter up to the left axillary artery and there it was secured in place. Given the success of this maneuver, the decision was made to cut the proximal end of the TIG catheter and remove it through the catheter inserted into the femoral artery. A selective angiography of the left upper limb arterial vasculature confirmed the absence of lesions (Figure 3). Right coronary artery catheterization subsequently revealed a normal coronary artery.

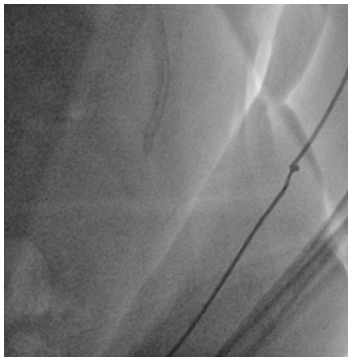

***Figure 1**. Loop within the TIG catheter.*

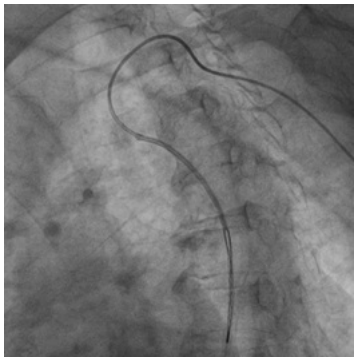

***Figure 2**. Progression of the EnSnare through the 7Fr JR4 catheter.*

***Figure 3**. Left upper limb angiography (post-procedure).*

Discussion: Twisting and loop formation within catheterization equipment is uncommon, but when it occurs, it can be challenging to resolve. Most of the time, the loop can be overcome using guidewires with different properties, such as hydrophilic guidewires. When this approach is insufficient, alternative arterial access and the use of snares can be helpful. Snares are instruments with a hook-like tip that assist in entangling the tip of the catheter and pulling it out from the area where it is stuck. The "mother-and-child" technique involves inserting a thinner catheter inside a thicker one, using the snare to secure the thinner catheter and facilitate its removal. Other techniques include using alternative access methods to untangle the catheter or applying external pressure (e.g., with a sphygmomanometer) while pulling the catheter. If all techniques fail, the patient should undergo surgical removal of the twisted catheter.

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8. TRAVELLING BY UNEXPECTED ROUTES - A CHALLENGING CASE OF CORONARY ANGIOPLASTY WITH CIRCULATORY SUPPORT

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A 76-year-old man presented to the emergency department in November of 2022 with a non-ST myocardial infarction. Coronary angiogram showed left main coronary artery and three vessel disease with a chronic occlusion of the proximal segments of circumflex and right coronary (RCA) arteries that prompted emergency beating heart CABG due to rhythm instability. A CABG from internal mammary artery to anterior descendant artery (ADA) was performed. Echocardiogram after surgery showed a mildly dilated left ventricule with mildly reduced ejection fraction.

In November of 2023 an episode of unstable angina motivated a new hospitalization with echocardiogram showing worsening left ventricule ejection fraction (24%) with hypokinesia of the posterior wall and all apical segments. A new coronary angiogram did not visualize the bypass. Coronary CT angiogram showed its occlusion. Due to the high risk of intervention, medical therapy was optimized, and he was discharged.

In the next appointment intervention was accepted and planed. And in December of 2023, angioplasty was performed with circulatory support with Impella®. Coronary rotablator procedure was used in main left artery to proximal and medial segments of the ADA, followed by implantation of 2 drug eluted stents (DES) guided by intravascular ultrasound. Additionally, 2 DES were implanted in RCA. The basal electrocardiogram presented complete right heart block and left anterior fascicular block. During procedure the patient developed a complete heart block with need of temporary cardiac pacing (TCP). Impella® was removed in the end of the procedure. The patient was admitted in the coronary care unit (CCU) with evolution in cardiogenic shock with initiation of dobutamine and noradrenaline. He developed an extensive femoral hematoma with anaemia (haemoglobin loss of 6 g/L after admission) and need of one erythrocyte transfusion unit. At day four in CCU vasopressors were stopped with good haemodynamic tolerance, but he remained dependent on TCP. Cardiac resynchronization therapy with defibrillation device (CRT-D) was implanted at day 15 of hospital admission, after treatment of a nosocomial pneumonia to *Klebsiella pneumoniae*. At day 21, the patient was discharged.

This case illustrates a complex case of coronary intervention where even a well-planned approach and multidisciplinary differentiated team management ended with prolonged hospital admission due to procedure and prolonged hospitalization associated complications. Exchange of knowledge

and sharing of difficult cases like this are an essential part to improving planning of these procedures and maybe improve patients' outcomes.

9. STENT IN MOTION: MANAGING A MIGRATORY STENT DURING PERCUTANEOUS CORONARY INTERVENTION

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Case report: A 69-year-old man presented to the emergency department with a complaint of persistent chest pain with cervical irradiation lasting for four hours. His past medical history included dyslipidemia and a previous smoking habit. His regular medication regimen included niacin 1,000 mg per day, with reference to statin and ezetimibe intolerance. The physical examination was unremarkable, confirming hemodynamic stability. The electrocardiogram revealed sinus rhythm with an incomplete right bundle branch block pattern. Initial blood workup showed increased high-sensitivity I troponin (37,628.5 pg/mL). A bedside transthoracic echocardiogram revealed systolic dysfunction (estimated ejection fraction of 35%), accompanied by global hypokinesia, particularly on the anterolateral, inferior and inferolateral walls. The persistent chest pain, which was not responsive to initial sublingual nitroglycerin or subsequent infusion of isosorbide dinitrate, led to the decision to perform immediate coronary angiography (CA). A CA study revealed an occlusion in the proximal segment of the left circumflex artery (LCx) (Figure 1). Ad hoc percutaneous coronary intervention (PCI) was performed, and during stent implantation (DES 2.5/20 mm), the patient took a deep breath that led to the displacement of the proximal part of the stent into the left main coronary artery (LM) (Figure 2). An initial assessment by intravascular ultrasound (IVUS) confirmed significant protrusion of the stent into the LM (which had a reference diameter of 5.5 mm), with an additional lesion located distal to the stent in the LCx (which had a reference diameter of 3.0 mm). LCx PCI was optimized with an additional 3.0/24 mm stent implantation (distal and superimposed on the previous stent, which was post-dilated with the 3.0 balloon). Then, a second guide wire was passed to the distal anterior descending artery outside the protruding stent (confirmed by IVUS) which was then crushed with a non-compliant balloon. LM PCI was performed using the Double Kissing Crush technique (with a 3.5/24 mm DES optimized to a 5.5 mm proximal diameter), resulting in a favorable final angiographic outcome (Figure 3), as confirmed by IVUS. Since no intercurrences were recorded, the patient was discharged on the second day of admission to a rehabilitation center, medicated with aspirin 100 mg, ticagrelor 90 mg bid, valsartan 80 mg, rosuvastatin/ezetimibe 20/10 mg, spirololactone 12.5 mg, bisoprolol 5 mg, dapagliflozin 10 mg and esomeprazole 20 mg. Four weeks following the angioplasty, no additional events were observed.

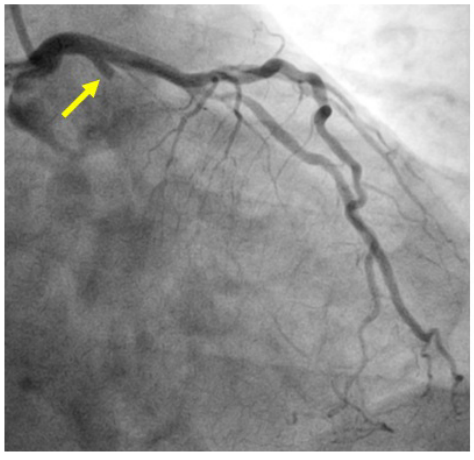

***Figure 1**. Occlusion in the proximal segment of the left circumflex artery.*

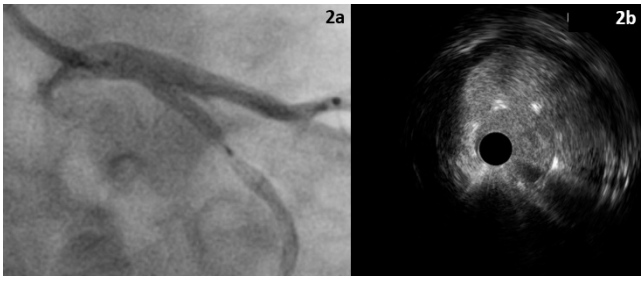

***Figure 2**. Displacement of the proximal part of the stent into the left main coronary artery (a: Angio, b: IVUS).*

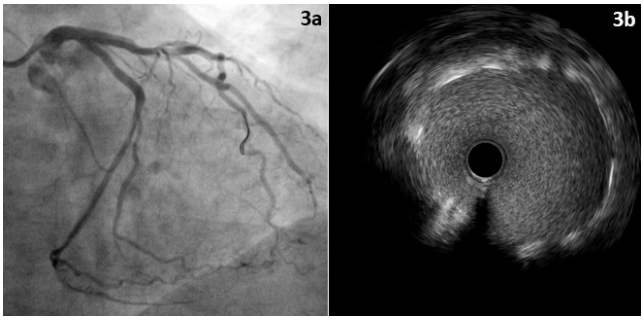

***Figure 3**. Final result (a: Angio, b: IVUS).*

Discussion: Coronary artery stent dislodgement is a rare condition that can occur during a percutaneous coronary intervention, with a reported incidence of 0.3% to 1.3% in the literature. It can pose a serious risk to patients, such as thrombosis, myocardial infarction, and coronary dissection. Several risk factors for its occurrence are recognized, including patient restlessness and small-sized, severely angulated and previously stented coronary arteries. Options for managing migratory stents include retrieving or repositioning the stent, surgical removal, or leaving the stent in place and post-dilating it to a larger size. The authors present a case where crushing the dislodged stent against the blood vessel wall was considered, with a satisfactory angiographic outcome. In addition, this clinical case highlights the role of intracoronary imaging in angioplasty, particularly in complex procedures.

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10. BRIDGING THE GAP: INTRACORONARY IMAGING IN MYOCARDIAL INJURY DIAGNOSIS

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Introduction: Coronary artery disease (CAD) remains the leading cause of death worldwide and can manifest through a wide range of presentations

given its dynamic nature. Despite being considered the gold standard approach for evaluating the presence and severity of CAD, coronary angiography (CA) is a two-dimensional lumenogram with several limitations. The authors present a case wherein intravascular imaging proved to be crucial in accurately determining the precise cause of myocardial injury.

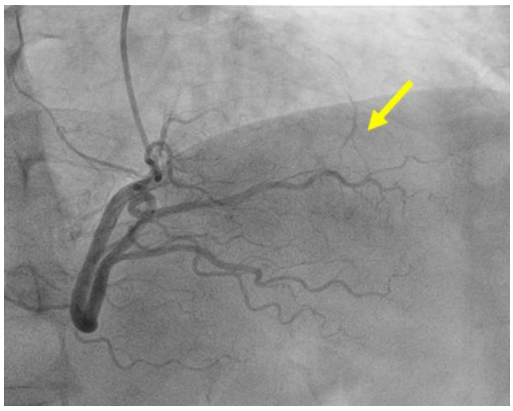

***Figure 1**. Retrograde filling of 2nd septal artery.*

Case report: A physically active 74-year-old man was admitted to the emergency department after experiencing a 30-minute episode of exertional chest pain with cervical irradiation, which resolved spontaneously after rest, accompanied by dizziness and profuse sweating. His past medical history included dyslipidemia, arterial hypertension and ventricular dysrhythmia, with a recent 24-hour Holter monitor revealing 51 monomorphic ventricular premature beats per hour. His regular medication regimen included aspirin 150 mg and nebivolol 2.5 mg. Physical examination was unremarkable with the exception of a hypertensive profile (166/89 mmHg). The electrocardiogram was normal and the initial blood workup showed increased high-sensitivity I troponin (335.9 pg/mL). The patient was transferred to the Cardiology department for further management. An echocardiogram showed a normal biventricular function without alterations of segmental kinetics. A CA study revealed a non-significant lesion in the left anterior descending artery at the level of bifurcation with the first diagonal artery, with the second diagonal artery being observed by heterocollaterals (Figure 1). Imaging findings from optical coherence tomography were suggestive of recent plaque rupture in the left anterior descending coronary artery, with a thrombus at the origin of the second septal artery (Figure 2). The hypothesis of a type 1 acute myocardial infarction was assumed and the patient was discharged medicated with aspirin 100 mg, ticagrelor 90 mg bid, valsartan 80 mg, rosuvastatin/ezetimibe 20/10 mg, nebivolol 2.5 mg and omeprazole 20 mg.

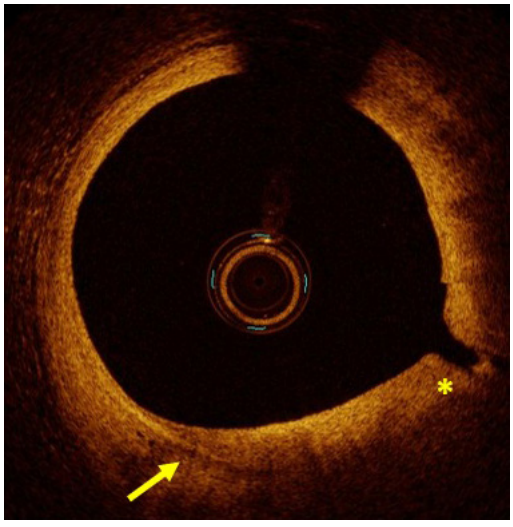

***Figure 2**. Layered plaque in the LAD (arrow), with a thrombus at the origin of the 2nd septal artery (*).*

Discussion: This clinical case highlights the importance of intravascular imaging for determining the etiology of myocardial injury. In this case, it allowed us to rule out the hypothesis of myocardial infarction in the absence of obstructive coronary artery disease (MINOCA) and to initiate specific treatment with anti-thrombotic/anti-platelet and anti-atherosclerotic therapies. Indeed, we cannot overlook the inherent limitations of CA in accurately assessing vessel and lumen geometry, evaluating plaque components, and detecting the presence of thrombus. Therefore, when diagnostic or angiographic uncertainty exists in the setting of acute coronary syndrome, we must recognize the critical role of intracoronary imaging.

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11. ON THE COUNT OF FOUR: A JOURNEY THROUGH RECURRENT CORONARY EPISODES

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Introduction: Spontaneous coronary artery dissection (SCAD) is a nonatherosclerotic cause of acute coronary syndrome (ACS) characterized by the development of a false lumen within the coronary artery wall[1]. SCAD accounts for approximately 4% of ACS cases. Rates of recurrent SCAD reported in literature vary between 10% to 30% and the factors associated with recurrency remain poorly understood. Most times, SCAD recurrence occurs in previous unaffected arteries[2,3]. Up to 95% of coronary arteries affected by SCAD demonstrate spontaneous healing on control angiography performed within 30 days after event[4].

Case report: We present the case of a 48-year-old woman with a history of two previous SCAD episodes, both managed conservatively. Her first SCAD event occurred 10 years ago, involving the terminal segment of the circumflex artery, while the second event, 4 years ago, affected the mid-distal segment of the anterior descending artery. The patient had no traditional cardiovascular risk factors and presented a negative autoimmune workup study. She was maintained on single antiplatelet therapy, statin, and beta-blocker. The patient presented to the emergency department with typical angina lasting one hour. The electrocardiogram on admission was normal and laboratory study revealed a minor elevation of troponin I (0.112 ng/mL), with no other relevant findings. Due to persistent pain after nitrate perfusion and minor ST segment elevation on the lateral leads, the patient was taken into urgent coronary angiography. It was documented a total resolution of both previous SCAD. *De novo*, it was observed a synchronous type 2 dissection of the proximal segment of the first diagonal branch and dissection of intermediate branch, with distal TIMI 3 flow. Both dissections were, once again, managed conservatively. Additionally, for etiologic study the patient underwent a CT scan with contrast of the whole body without evidence of dissection in other territories or fibromuscular dysplasia.

Discussion: This case report exemplifies the effectiveness of conservative management in SCAD, highlighting the paramount importance of accurately diagnosing SCAD among the differential diagnoses of ACS. Proper identification and management of SCAD can lead to favorable outcomes, as seen in this patient with multiple recurrent episodes. This patient was managed with single antiplatelet therapy, statins, and beta-blockers following the first SCAD event, underscoring the need for further research into SCAD recurrence and prevention strategies. Also, she presented no risk or predisposing factor for these events which reinforces the need for a low index of suspicion for this differential diagnosis.

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12. FISHING FOR A CONTRACEPTIVE IMPLANT

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A 21-years-old female without previous medical history was referred to Gynecology for contraceptive implant removal. An Implanon NXT had been implanted in the patients left arm 3 years prior in a primary care facility. Upon examination, the contraceptive device was not palpable nor found on upper limb X-ray.
Considering the hypostasis of migration, computed tomography scan showed a hyperdense 4 cm long linear structure in a segmental branch of the distal left lower lobar pulmonary artery consistent with the migrated device.
The patient was referred to interventional cardiology for percutaneous extraction. The procedure started with an ultrasound-guided right femoral venous access, followed by selective catheterization of the lower left lobar artery's middle segmental branch with a JR 4.0 (5F) catheter (Figure 1). With a 10 mm ONE Snare® (Merit Medical Systems Inc., Salt Lake City, Utah, USA) the device was grasped in its mid-portion. Little resistance was felt as the snare and catheter were pulled back. *En bloc* removal of the system was performed with success, followed by manual compression of the vascular access (Figure 2). Post-intervention echocardiogram excluded injuries to the tricuspid valvular apparatus. The patient was discharged on the same day without evidence of acute complications.

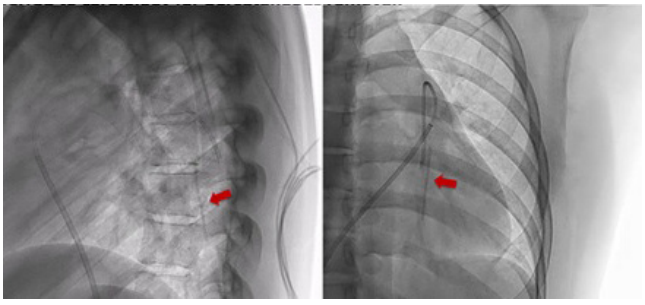

***Figure 1**. Fluoroscopy demonstrating the embolized rod-shaped contraceptive implant (red arrows) in the left lower lobar artery's segmental branch.*

Contraceptive implant migration is a common complication, especially due to deep insertion, being commonly found in the neighboring soft tissues. However, while intravascular migration is seldom seen, dislodgement to the pulmonary circulation is an even rarer occurrence. Accidental insertion into one of the arm's greater veins might explain these phenomena.
There have been several reports of vascular migration of these implants, some of them to the pulmonary circulation[1]. Therapeutic strategies varied between conservative approaches, percutaneous ones (including snaring or aspiration) and even surgical procedures[2-5].
In this case, although a conservative strategy was discussed, the patient opted for implant removal due to the desire to get pregnant and potential long-term complications. Due to expected feasibility and low expected risk, we decided on a percutaneous approach.
In conclusion, in cases of contraceptive implant intravascular migration to the pulmonary circulation, percutaneous extraction by snaring is a safe and effective therapeutic option for this young population. It is less invasive when compared to a surgical approach, with a likely reduction in procedural morbidity.

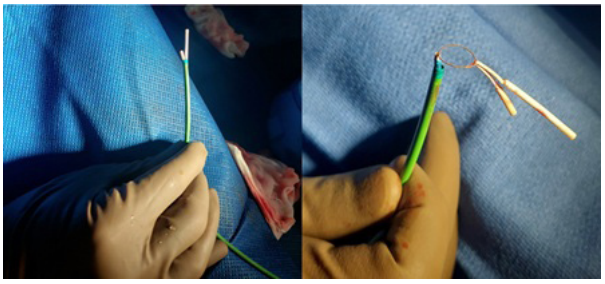

***Figure 2**. Contraceptive implant after removal.*

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13. WHEN LESS IS MORE - THE VALUE OF NOT INTERVENING

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Introduction: Spontaneous coronary artery dissection (SCAD) is a nontraumatic, noniatrogenic separation of the coronary arterial wall and is an infrequent cause of acute myocardial infarction. The incidence of SCAD is 0.5-0.7 and it is likely more common in younger females presenting with acute coronary syndrome (ACS). Twenty percent of SCAD cases are idiopathic; other patients are pregnant or postpartum, have fibromuscular dysplasia, connective tissue disorders, and other associated conditions. SCAD should be considered in any young patient who presents with an acute myocardial infarction or cardiac arrest, especially if they are female and have no risk factors or history of coronary heart disease. In most SCAD patients, conservative therapy is the preferred strategy after the diagnosis is secured; however, this depends on whether the patient is clinically stable or unstable.
Case report: We present the case of a 48-year-old woman, admitted to the emergency department with symptoms compatible with ACS, including chest pain and nausea. Her medical history includes dyslipidemia and two episodes of spontaneous coronary artery dissection in the context of probable fibromuscular dysplasia (FMD). The first event occurred in 2020 when she was admitted for complaints compatible with ACS, and coronary angiography showed the first obtuse marginal artery with an image suggestive of SCAD type 2. In 2022, she was admitted again for suspected ACS, with angiography showing the anterior descending coronary artery with an image suggestive of SCAD. At this point, an angiotomography of the

cervical, thoracic, and abdominal regions was performed for etiological study, which demonstrated luminal irregularities in the cervical segment of the internal carotid arteries at the C1-C2 axial level, where a 'string of beads' pattern may be present. Additionally, a small irregularity was noted in the right vertebral artery, which, in the clinical context, favors the diagnosis of FMD. Furthermore, Tests for autoimmune disease were negative. Despite adherence to medical treatment with aspirin, bisoprolol, and atorvastatin, in 2023, the patient was again readmitted with symptoms compatible with ACS. Once again, coronary angiography revealed an image suggestive of SCAD in the distal segment of the first diagonal artery. It is worth mentioning that in all three episodes, the patient remained hemodynamically stable, and symptomatic control was possible with pharmacological treatment. Therefore, a conservative approach without coronary angioplasty was chosen.

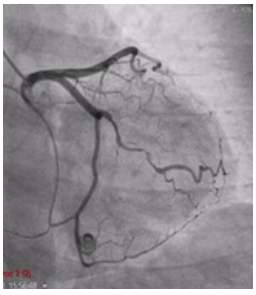

***Figure 1**. Image suggestive of SCAD in the first obtuse marginal artery.*

***Figure 2**. Image suggestive of SCAD in the anterior descending coronary artery.*

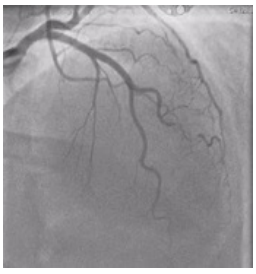

***Figure 3**. Image suggestive of SCAD in the distal segment of the first diagonal artery.*

Discussion: While uncommon, SCAD should be considered in any young patient, especially females, without a history of coronary heart disease or cardiovascular risk factors. Long-term sequelae include recurrent myocardial infarction (17%), recurrent SCAD (10% to 17%), and mortality rates are relatively low (0.8% after 3 years). This case highlights the challenge in managing spontaneous coronary dissection, the limited scientific evidence for medical treatment, and the risk of recurrence.

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14. LOOKING BEYOND EPICARDIAL VESSELS: SYSTEMATIC APPROACH TO INOCA PATIENTS

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We present a 75 year-old woman with a past medical history of hypertension, type 2 diabetes mellitus and dyslipidemia. She was on lisinopril 20 mg, bisoprolol 2.5 mg, indapamida 1.25 mg, gliclazida 6 mg, metformina 1,000 mg, omeprazol 20 mg, aspirina 100 mg, atorvastatina 40 mg.

She was referred for a Cardiology medical appointment because of recurrent episodes of chest pain that irradiated to the mandible, with a sudden onset, sometimes triggered by effort. Cardiac stress test did not reveal ST-T changes or reproducible chest pain. Coronary CT scan revealed calcium score of 399 (P85) and coronary angiography showed non-obstructive lesions in LAD and RCA.

Since she had persistent and frequent episodes of chest pain, the diagnosis of angina with non-obstructive coronary arteries (ANOCA) was admitted and an invasive coronary functional test was performed.

In our center, a standardized protocol was implemented to determine each ANOCA/INOCA endotype, that may co-exist: epicardial spasm (ES) and microvascular dysfunction (MVD), both endothelium-dependent and endothelium-independent.

A pressure-temperature guidewire is inserted into LAD and an RFR is obtained. If RFR > 0.89 is documented, the study proceeds to step 1 (ACh protocol) and step 2 (adenosine protocol).

In step 1, ACh is infused in crescent doses (2 ug > 20 ug > 100 ug > 200 ug). Firstly, and before the ACh vasodilator doses (2 ug and 20 ug), we measure the mean resting time. Thereafter, we infuse 2 ug Ach followed by 20 ug Ach infusion. In the absence of epicardial vasospasm, we measure the mean hyperemic time to calculate the AChFR (endothelium-dependent microvascular function). A AChFR < 1.5 is considered positive. Subsequently, we infuse the ACh vasoconstrictor doses (100 ug and 200 ug) to assess ES. Intra-coronary nitrates are administered to reverse any ES. Of note, in our protocol, we measure the RFR for each dose of ACh infused.

In step 2, we calculate a new mean resting time and begin adenosine perfusion at 140 ug/kg/min. We then calculate the mean hyperemic time to measure de CFR (endothelium-independent microvascular function). A CFR < 2 is considered positive.

In our patient the basal RFR was 0.94. After the 2 ug and 20 ug of ACh no ES was observed. The RFR were 0.90 and 0.89, respectively. The AChFR calculated after the 20ug ACh infusion was 0.9.

After the 100 ug ACh infusion, chest pain was reproduced, a < 90% epicardial stenosis was observed with a corresponding RFR of 0.86 but no ECG changes were detected. After the 200 ug ACh infusion, chest pain was reproduced, a > 90% epicardial stenosis was observed with a corresponding RFR of 0.77 and ECG changes were not observed. Intra-coronary nitrate reversed the spasm and chest pain was relieved. Regarding the endothelium-independent microvascular function, a CFR of 1.3 and IMR of 14 was calculated.

Based on our findings, we concluded that our patient has ES, endothelium-dependent MVD and endothelium-independent MVD.

Beta-blocker were withdrawn and verapamil 240 mg LP and TD nitroglycerin 10 mg were started. Statin and IECA were continued. 3 months after, the patient did not report any episode of chest pain.

This case illustrates a systematic approach to patient with ANOCA/INOCA, standardized in our center. It highlights the importance of understanding the different endotypes and its pathophysiologic mechanisms.

It underscores the therapeutic changes involved that had a positive impact in our patient.

15. ST-SEGMENT ELEVATION, NOT ALWAYS AN OCCLUDED VESSEL

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We present a 62-year-old male with multiple cardiovascular risk factors: dyslipidemia, active smoking, hypertension, overweight and alcoholism. He had a past medical history of non-ischemic cardiomyopathy with heart failure with reduced ejection fraction. He recalls a history of intensive chest pain at rest in 2022 which did not reveal any epicardial coronary obstruction. He was currently medicated with sacubitril-valsartam 49/51 mg bid, dapagliflozina 10 mg id, espironolactona 12.5 id, bisoprolol 2.5 mg id, furosemida 20 mg id, pantoprazol 20 mg id, rosuvastatina + ezetimibe 20+10 mg id.

He went to the emergency department with sudden onset oppressive and constant chest pain associated with nausea. Physical examination was unremarkable.

ECG revealed a 3-mm ST-segment elevation in inferior leads. Transthoracic echocardiography revealed inferior and posterior akinesia in the left ventricle with mild systolic function impairment. The patient was admitted at the cath lab for primary PCI.

At admission the chest pain had relieved with sublingual nitrate and the ECG did not show ST segment elevation. Diagnostic coronary angiography did not reveal any obstructive lesion or occluded epicardial vessel. Given the high probability of coronary epicardial spasm, the team proceeded to vasospasm predisposition test using intra coronary ACh.

First, we injected 80 ug ACh in the right coronary artery which did not reveal any eoicardial vasospasm. Subsequently, 100 ug ACh were injected in left coronary artery with no significant vasospasm observed. A last dose of 200 ug ACh induced a significant coronary spasm in both circumflex and left anterior descending, with concomitant ST-segment changes and chest pain reproduction. Intra-coronary nitrate (4 cc DNI) was injected to reversed the spasm, with further chest pain relief and ST-segment normalization. Prinzmetal angina diagnosis was made. Beta-blocker are avoided and nitrate and CCBs should be used to reduce episodes of chest pain.

This case highlights a known cause of ST-segment elevation without obstructive coronary lesions. Epicardial spasm may be frequently missed as ST-segment are dynamic and may not be appreciated. If there is a clinical suspicion, vasoreactivity ACh test should be performed. Therapeutic changes are crucial is this clinical setting.

16. EMBOLIC ATTACK - AN ATYPICAL STEMI

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Mulher, 37 anos, indigente, com antecedentes de de asma, hepatite C não-tratada, perturbação de personalidade, história de intoxicação medicamentosa voluntária por benzodiazepinas, tabagismo, etilismo e consumos ativos de heroína, cocaína, haxixe e novas substâncias psicoativas. Encontrada inconsciente na via pública. À chegada ao serviço de urgência, não colaborante, agitada, a necessitar de imobilização e sedação. Pedida avaliação analítica e ECG como avaliação inicial, revelando-se supra-ST em V1-V6, DI e aVL. Não sendo possível apurar melhor a história, assumido enfarte agudo do miocárdio com supradesnivelamento de ST (EAMCSST). À chegada à sala de hemodinâmica, episódio de fibrilhação ventricular revertido após 1 choque de desfibrilhação e evolução em choque cardiogénico: iniciado suporte com noradrenalina e ventilação mecânica invasiva. Coronariografia revelou oclusão do segmento médio da descendente anterior (DA), envolvendo a emergência da 1.ª diagonal, que apresentava imagem sugestiva de trombo (Figura 1). Prosseguiu-se para angioplastia primária: tentativa inicial de aspiração mecânica de trombo, sem sucesso; seguiu-se angioplastia por balão que resultou em fenómeno de *no-reflow*; administrados nitratos, adenosina e eptifibatide intra-coronários com melhoria apenas transitória de fluxo distal pelo que se optou por implantação de um *stent* do segmento proximal da DA ao médio, resultando em recuperação de fluxo distal TIMI I. Por permanecer em choque refratário, procedeu-se a implantação de segundo *stent* distal ao anterior, com recuperação de fluxo distal TIMI II, preenchendo o segmento apical da DA. Alcançada estabilidade hemodinâmica, deu-se por terminado o procedimento e a doente foi admitida em Unidade de Cuidados Intensivos com indicação para dupla anti-agregação plaquetar (TAPD).

Seguiu-se avaliação ecocardiográfica que demonstrou ventrículo esquerdo (VE) gravemente dilatado, com hipertrofia excêntrica grave e disfunção sistólica moderada (FEVE 35%), alterações segmentares no território da DA e imagem hiperecogénica e hipermóvel de grandes dimensões apensa à válvula aórtica, sugestiva de vegetação e condicionando regurgitação grave. Ecocardiograma transesofágico confirmou endocardite da válvula aórtica, com a maior vegetação apensa à cúspide não coronária, a oscilar entre a câmara de saída do VE (Figura 2) e o plano supravalvular, e com perfuração de cúspide associada; e ainda uma segunda massa, menor, apensa à cúspide coronária esquerda.

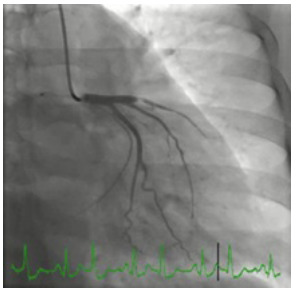

***Figura 1**. Oclusão ao nível da DA média.*

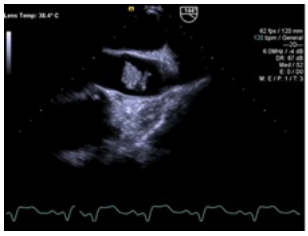

***Figura 2**. Vegetação de grandes dimensões (37,5 mm) apensa à válvula aórtica, a oscilar na câmara de saída do VE.*

Assim, admitiu-se quadro de choque misto (cardiogénico e séptico) com disfunção cardiovascular, respiratória e renal, em contexto de endocardite de válvula aórtica nativa com embolização séptica coronária, renal, digital e esplénica. Hemoculturas com isolamento de *Staphylococcus aureus* sensível à meticilina, pelo que iniciou antibioterapia dirigida com flucloxacilina.

Evolução desfavorável com evento cerebrovascular isquémico e hemorrágico major, condicionando edema cerebral generalizado grave e irreversível, levando ao óbito ao 13.º dia de internamento.

A Síndrome Coronária Aguda por embolização séptica coronária é uma apresentação rara de endocardite infecciosa que requer elevado nível de suspeição para diagnóstico e está associada a elevada mortalidade. A sua abordagem é desafiante, dado não existir evidência robusta que permita standardizar a prática clínica. Perante oclusão coronária, recomenda-se aspiração de trombo e/ou angioplastia com balão[1-3]. A implantação de stent é sugerida em caso de falência das anteriores, alertando-se para o acrescido risco hemorrágico de iniciar TAPD neste contexto e de aneurisma micótico coronário[4].

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17. BALLOON SHAFT FRACTURE: AN UNEXPECTED CHALLENGE IN CORONARY ANGIOPLASTY

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Doente do sexo masculino, 37 anos. Fumador (~70 UMA), sem outros antecedentes de relevo. Desenvolve quadro súbito de precordialgia com irradiação à mandíbula e membro superior esquerdo, associado a lipotímia e sudorese. Transportado ao serviço de urgência da área de residência onde realiza ECG descrito como em ritmo sinusal com padrão Qs e supra-ST em V1-V3. Assumido enfarte agudo do miocárdio com supradesnivelamento de ST (EAMCSST) anterior, pelo que foi ativada a via verde coronária. Fez carga de ácido acetilsalicílico e ticagrelor e, por não se encontrar num centro de intervenção coronária, fez ainda fibrinólise com tenecteplase e foi enviado ao centro de angioplastia mais próximo. À chegada, sem recorrência de angor, mas mantendo supra-ST anterior (Figura 1). Realizado ecocardiograma que evidenciou disfunção sistólica moderada do ventrículo esquerdo (FEVE 32%), com alterações da cinética segmentar no território habitual da descendente anterior e sem outras alterações de relevo. A coronariografia urgente identificou uma lesão curta de 50-70% no segmento médio da descendente anterior. Prosseguiu-se para angioplastia guiada por IVUS, que revelou imagem de placa, sem cálcio. Implantou-se *stent* 4,5 × 23 mm seguido de pós-dilatação com balão. Após dilatação, aquando da retração do balão, este ficou encravado dentro do segmento inicial do cateter guia, com a ponta rádio-opaca distal a terminar no osteum do tronco comum. Tentativa de tração do balão, sem sucesso e que conduziu à fratura da haste do balão no seu terço distal. Seguiu-se tentativa de passagem de várias guias de intervenção entre a parede do cateter guia e o balão, também sem sucesso (*BMW, Whisper, Runthrough*). Optou-se então pela remoção de todo o material endovascular em bloco, não se observando mobilização da ponta distal do balão. A remoção decorreu sem intercorrências até ao nível do introdutor na artéria radial direita. A este nível, conseguiu-se remover o cateter guia, contudo, o balão não atravessou novamente o seu bordo distal. Uma vez que a extremidade proximal da haste fraturada ficou exteriorizada com esta manobra, procedeu-se com sucesso à remoção em bloco do restante material (Figura 2). Posteriormente constatou-se que a obstrução estava em relação com a desinsuflação incompleta do balão (Figura 3).

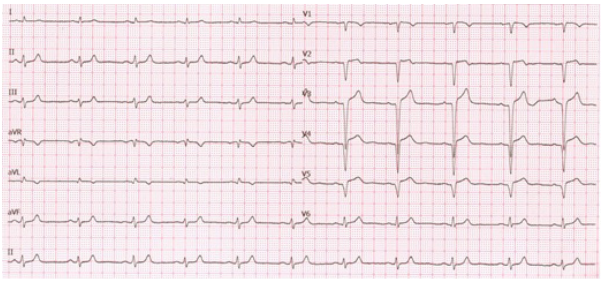

***Figura 1**. ECG pós-fibrinólise.*

A fratura de haste de um balão de angioplastia é uma complicação que pode ocorrer em qualquer procedimento complexo. Existem várias técnicas passíveis de utilização para extração de material fraturado endovascular. A sua escolha dependerá sempre do mecanismo de fratura.

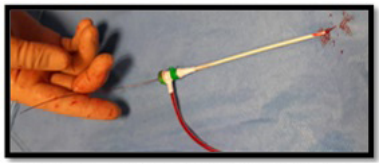

***Figura 2**. Material removido em bloco.*

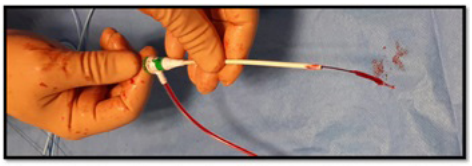

***Figura 3**. Constatação de desinsuflação incompleta do balão.*

18. IATROGENIC LEFT MAIN ARTERY DISSECTION: SAVED BY THE RETROGRADE FLOW?

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A 78-year-old woman presented with complaints of Typical retrosternal chest pain with moderate exertion for 6 months (CCS 2) and heart failure symptoms in NYHA class II. Her history was positive for hypertension, dyslipidemia and gastric neoplasm treated in the past and in remission at presentation (submitted to chemotherapy and radiotherapy). Her regular medication included clopidogrel 75 mg, atorvastatin 40 mg, lercanidipine 10 mg, bisoprolol 2.5 mg, dapagliflozin 10 mg, spironolactone 25 mg, esomeprazole 20 mg, and telmisartan + hydrochlorothiazide 80 mg + 25 mg. The patient had a myocardial perfusion scintigraphy positive for ischemia in the anterior wall, an echocardiogram relevant for hypokinesia in the mid and apical segments of the anterior wall and the anterior septum and with biplane ejection fraction (LVEF) is 43%.
She underwent cardiac catheterization, revealing chronic occlusion of the left anterior descending (LAD) artery (Figure 1). After multidisciplinary discussion, the decision was made to proceed with a LAD intervention.

***Figure 1**. Chronic occlusion of the left anterior descending (LAD) artery.*

After initial injection using an extra support guiding catheter (EBU 3.75, 7 Fr, Medtronic, USA) an iatrogenic dissection of the left main artery was observed, and it was not possible to pass a guidewire to the Left Anterior Descending (LAD) artery or the Left circumflex (LCX) artery. A repeated injection showed that the runthrough guidewire was located in the false lumen, with retained contrast (Figure 2). The left main artery was then catheterized with a JL curve 4, 6Fr catheter (using the ping pong technique), and a guidewire was passed to the LCX in the true lumen (confirmed by

IVUS). With support from a Sasuke microcatheter, it was possible to pass the guidewire to the LAD.
A direct stent Xience Skypoint (3.5 × 33 mm) was implanted from the left main artery to the LCX, followed by a proximal optimization technique with a non-complaint balloon (5 x 8mm), reestablishing TIMI 3 flow, followed by angioplasty of the proximal LAD/D1 with a Xience Skypoint coated stent (2.5 × 33 mm) using the T-stenting and small protrusion (TAP) technique and final kissing balloon. It was decided not to pursue with PCI of LAD CTO at this moment.
Control injection shows a dissection flap of the ostial left main artery extending to the aortic root (limited to the Sinus of Valsalva) (Figure 3). It was not possible to cover the ostium of the common trunk as it had a diameter of 8 mm. The procedure was guided by IVUS.

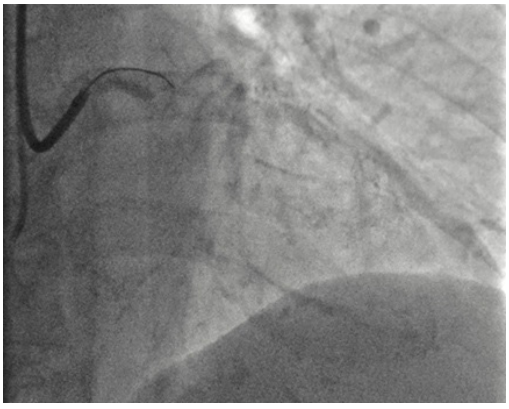

***Figure 2**. Iatrogenic Left Main Artery Dissection.*

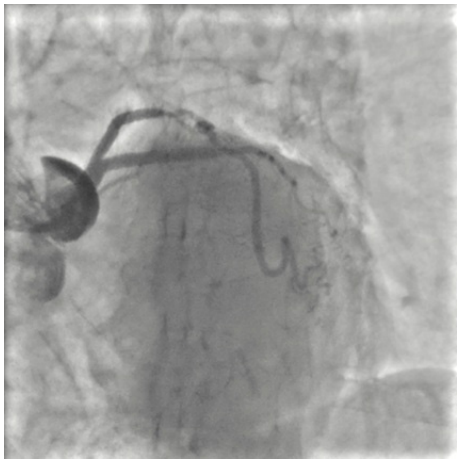

***Figure 3**. Control injection showing a dissection flap of the ostial LM artery extending to the aortic root (limited to the Sinus of Valsalva).*

A dissection of the left main artery is a serious complication of angiography and angioplasty that requires immediate management, through stenting when possible. It occurs in approximately 0.02% of cases. It is essential to ensure proper management of the materials and instrumentation. IVUS plays an important role in assessing the true lumen and the extent of the dissection. Finally, it is important to balance risk *versus* benefit of treating chronic total occlusions, with an approach varying case to case.

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19. HEART IN CRISIS

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This case refers to a 60 year old male, non-smoker, with past medical history of type 2 diabetes, controlled with oral medication. He presented to the Emergency Department (ED) with sudden onset of oppressive chest pain radiating to the neck and profuse sweating. On admission he still had mild discomfort, despite analgesic treatment, and was hypotensive (MAP 58 mmHg), with signs of poor peripheral perfusion. Arterial blood gases analysis showed elevated lactates (3.23 mmol/L). His ECG revealed sinus rhythm, with diffuse ST segment depression and ST elevation in aVR. He had elevated troponin I (2.8 ng/mL). Summary echocardiogram showed moderate depression of LV systolic function, apical and anterior akinesia and distal IVS and mid-distal lateral and posterior hypokinesia. An emergent coronary angiography was performed through a right radial arterial access, which showed ostial Left Main (LM) stenosis of 95%. Intra-aortic balloon placed for mechanic hemodynamic support. Two BMW II guide wires were advanced to the distal LAD and distal CX, and the LM-LAD and LM-CX lesions were pre-dilated with a 2.5 × 12 mm balloon at 14 atm. A DES (Xience Skypoint, 4.0 × 15 mm) was implanted in the LM-LAD at 20 atm, followed by POT with a 4.5 × 8 mm NC balloon at 20 atm. The final final angiographic result was good. During his hospitalization, the patient evolved favorably, with a maximal Killip Class of I. Peak troponin I: was of 60,816 ng/mL. Echocardiogram showed moderate depression of LV systolic function (LVEF 38%) and akinesia of the apex, distal SIV and distal anterior wall and anterior medio-basal and postero-lateral medio-distal hypokinesia. No major complications occurred.

20. SILENT CATASTROPHE

Inês Macedo Conde, Rodrigo Silva, Mónica Dias, Sofia Fernandes, Carla Ferreira, Filipe Vilela, Bárbara Rocha, João Faria, Jorge Marques, João Costa, Carlos Galvão, Catarina Quina Rodrigues

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This case refers to a 63 year old male, smoker, with no relevant past medical history. He presented to the Emergency Department (ED) with complaints of nausea and vomiting with a few hours onset, with no chest pain, dyspnoea or other complaints. He was previously asymptomatic. On admission he was hypotensive (MAP 55 mmHg), with signs of poor peripheral perfusion. While in the ED he had one episode of NSTV. Arterial blood gases analysis showed type 1 respiratory failure and elevated lactates. His ECG revealed atrial fibrillation (89 bpm), left anterior hemifascicular block, ST elevation in DI and aVL and V1 and ST depression in the inferior leads, isolated ventricular extra-systole. An emergent coronary angiography was performed through a right radial arterial access, which showed a left main (LM) distal occlusion, with a saddle thrombus extending to the anterior descending artery (LAD) and circumflex artery (CX). Two BMW II guide wires were advanced to the distal LAD and distal CX, and the LM-LAD and LM-CX lesions were pre-dilated with a 2.0 × 12 mm balloon. A DES (Xience Skypoint, 3.5 × 23 mm) was implanted in the LM-LAD at 16 atm, followed by POT with a 4.0 × 12 mm NC balloon at 16 atm. Due to an image suggestive of thrombus on the distal edge of the stent, an additional DES (Xience Skypoint, 3.5 × 12 mm) at 12 atm was overlapped with the distal stent. The final final angiographic result was good, and although an image suggestive of thrombus remained in the ostium of the CX, it wasn't flow limiting. He was started on GP IIb-IIIa inhibitors. Intracoronary OCT imaging showed a well-apposed and well-expanded stent with no image suggestive of complication and no edge dissection. Following this procedure, he was admitted to the Cardiac ICU. During his hospitalization he needed transient support with noradrenaline, with overlapping Levosimendan cycle. Initially, ventilatory support was required with non-invasive ventilation (V60). It was possible to progressively reduce ventilatory support until suspension. Peak troponin I was 298 ng/mL. Echocardiogram showed severe depression of global left ventricular

systolic function (LVEF 24%), with anterior wall, apex, and middle and distal segments of the septum and distal segments of the remaining walls akinesia. Additionally, he was diagnosed with Aspiration Pneumonia, and completed 8 days of Amoxicillin/Clavulanic Acid, with significant improvement. He was discharged on clopidogrel, DOAC, statin and disease modifying drugs, and was referred for Cardiac Rehabilitation Program.

21. GUIDEWIRE-INDUCED PERFORATION. THE IMPORTANCE OF A FINAL ANGIOGRAPHY

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Case report: This is a case of a 65-year-old male, with multiple cardiovascular risk factors (smoker, hypertension and type 2 Diabetes mellitus). The patient did not have a relevant past medical history and his daily medication was acetylsalicylic acid 100 mg, losartan 50 mg, metformin 1,000 mg + Vildagliptin 50 mg, insulin and rosuvastatin 20 mg + ezetimibe 10 mg. He was admitted in our hospital to perform an elective coronary angiography due to complaints of fatigue and abnormalities in the medical exams performed - a treadmill exercise test positive for ischemia and a coronary artery Calcium Scan > 1,000 HU. Coronary angiography showed two vessels disease, with proximal LAD 80%, ostial Cx 50%, mid RCA 80%. Optical coherence tomography (OCT) guided angioplasty of the proximal LAD lesion was performed: pre-dilation with a 3 mm NC balloon, followed by Orsiro 3 × 40 mm DES implantation. After implantation of the stent, impairment of flow on the distal part of the left main was observed and shockwave was performed, followed by 3.5 NC balloon and placement of a DES Ultimaster Nagomi 3.5 × 24 mm in the distal part of LM/LAD ostium. Finally, proximal optimization technique was performed with a 5.5 mm NC balloon. When the last images with contrast were taken, something was noticed - a distal perforation of the LAD artery. Balloon inflation was performed, with apparently good angiographic result, and transthoracic echocardiogram (TTE) at the end of the procedure did not show evidence of pericardial effusion so, once the patient was hemodynamically stable, he was sent to the coronary ICU for close monitoring. However, after approximately one hour, he developed symptoms suggestive of cardiac tamponade, and returned to the cath lab to perform pericardial drainage under TTE and fluoroscopy, and distal LAD perforation was then treated with placement of two ruby coils (2/10 mm and 2/20mm), with complete occlusion of the distal part of the artery.

Discussion: The patient remained stable during hospitalization and was discharged after 5 days with a reassessment TTE showing minimal layer of posterior pericardial effusion. After 6 weeks, he returned for reassessment of the previous angioplasty, which showed good angiographic result, and to perform an angioplasty of the RCA lesion, with placement of a Synergy 3.0 × 48 mm DES, with good final angiographic result. Guidewire-induced coronary perforation, although rare, are frequently associated with aggressive/prolonged procedures and chronic total occlusions and may have catastrophic consequences if unsuspected or poorly managed. If it is identified during the procedure, different "conservative" strategies may be implemented while the patient is haemodynamically stable. In our case, the final injection image after the procedure was crucial to identify coronary perforation, to decide about patient's management and to promptly identify and treat possible complications.

22. TICKING TIME BOMB: THE CRITICAL OVERLAP OF VASOSPASTIC DISEASE AND ATHEROSCLEROSIS IN THE LEFT MAIN CORONARY ARTERY

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Introduction: In approximately half of the patients undergoing invasive coronary angiography for angina no angiographically obstructive lesions are documented. These patients are typically referred for MINOCA evaluation, with vasospastic disease frequently diagnosed. However, with the increasing use of IVUS, subtle atherosclerotic lesions have been identified at the site of vasospasm in patients with vasospastic angina and seemingly normal coronary arteries. These lesions tend to grow rapidly, leading to a poor prognosis for these patients. This finding is supported by studies indicating that vasospastic disease can induce local thrombus formation and an active inflammatory response, which contributes to the rapid progression of plaques and subsequent ischemic events[1].

Case report: A 43-year-old woman presented to the consultation with complaints of typical exertional angina. Her cardiovascular risk factors included active smoking and dyslipidemia, which had been managed through lifestyle modification. The evaluation of her anginal symptoms revealed a positive exercise stress test with a hypertensive response. A transthoracic echocardiogram showed normal left ventricular function with no segmental wall motion abnormalities. Given her gender and clinical presentation, a coronary CT angiography was performed, revealing normal arteries with no calcification (calcium score = 0). In this context, it was decided to proceed with MINOCA evaluation, including functional testing during catheterization. An ostial lesion of the left main coronary artery was identified, accompanied by a significant drop in blood pressure, ST-segment depression, and reproduction of the patient's chest pain. Intravascular ultrasound (IVUS) demonstrated a low atherosclerotic burden (MLA 8 mm^2 before DNI and 10 mm^2 after 10 mg, plaque burden 24%, with approximately 50% reduction in vessel caliber), but the fractional flow reserve (FFR) suggested a functionally significant lesion. Additionally, the patient exhibited vasospastic disease, with vasospasm induced in the mid and distal segments of the left anterior descending artery after the injection of 100 mcg of acetylcholine, reproducing her symptoms, which were subsequently reversed with 2 mg of intracoronary dinitrate. Given the location of the disease and the patient's age, coronary artery bypass grafting (CABG) was recommended. Prognosis-modifying therapy was initiated, including aspirin, high-potency statin, antihypertensive medication, and strong advice for immediate smoking cessation, in addition to antianginal therapy. A cardiac MRI was also requested for better ischemic characterization, revealing subendocardial perfusion defects in the territory of the left coronary artery, involving the septum, anterior, and lateral walls, without evidence of scar or focal fibrosis. However, the patient declined CABG, necessitating percutaneous coronary intervention (PCI) guided by IVUS for the left main coronary artery lesion and management of vasospasms. The patient showed favorable progress with no recurrence of pain after 2 months of follow-up.

References

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23. THE INVISIBLE CULPRIT - UNVEILING PLAQUE RUPTURE AND RED THROMBUS IN MINOCA

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Homem de 49 anos, engenheiro civil, com antecedentes de hipertensão arterial, tiroidite de Hashimoto e ex-fumador (dos 18 aos 29 anos). Encontrava-se medicado com Amlodipina + Valsartan, Levotiroxina, Triticum e Doxilamina.

Apresentou-se com dor precordial constritiva, irradiada para o ombro esquerdo, acompanhada de náusea. A dor iniciou-se durante uma atividade física (andar de bicicleta), inicialmente intensa, mas melhorando progressivamente. Nega dispneia, palpitações, vómitos ou sudorese. Relata episódios prévios semelhantes ao longo do último ano, que se resolveram espontaneamente.

O exame físico revelou pressão arterial de 143/81 mmHg, frequência cardíaca de 87 bpm, saturação de oxigénio de 98% em ar ambiente e estado geral estável. O eletrocardiograma mostrou ritmo sinusal sem alterações significativas do segmento ST. As análises laboratoriais indicaram leucocitose (12.400), troponina elevada (1.008 pg/mL) e função renal ligeiramente alterada (creatinina 1,36 mg/dL).

Foi internado com diagnóstico de enfarte agudo do miocárdio sem supra de ST (NSTEMI). Após realização de cateterismo cardíaco, não se identificou doença coronária obstrutiva significativa. No entanto, foi decidido realizar imagem intra-coronária com tomografia de coerência ótica (OCT), que revelou a presença de um trombo vermelho volumoso na artéria descendente anterior proximal, associado a disrupção de uma placa lipídica.
Durante o internamento, manteve uma evolução estável, sem recorrência de dor torácica, com função cardíaca preservada (fração de ejeção do ventrículo esquerdo de 62%). Foi tratado com terapêutica antitrombótica tripla durante o internamento e recebeu alta com medicação antiagregante dupla e estatina de alta intensidade, juntamente com recomendações para controlo rigoroso dos fatores de risco cardiovascular e seguimento em consulta de cardiologia. A utilização da Tomografia de Coerência Ótica (OCT) revelou-se crucial neste caso, pois permitiu a visualização detalhada do trombo e da disrupção da placa, lesões que não foram evidenciadas de forma clara pela angiografia convencional.

24. CHESSBOARD OF CORONARY INTERVENTION

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Paciente masculino de 83 anos, com antecedentes de hipertensão arterial, diabetes mellitus tipo 2, dislipidemia e fibrilhação auricular permanente, apresentou-se no serviço de urgência com sintomas de pré-síncope, angina, fadiga e edema significativo dos membros inferiores, com uma evolução de dois meses. Apesar destas queixas, os resultados laboratoriais iniciais foram normais, com troponina I de alta sensibilidade ligeiramente elevada com 27,7 ng/L. O exame físico revelou sons cardíacos irregulares, com um sopro no bordo esternal esquerdo, fervores basais e edema com godet significativo nos membros inferiores.
O eletrocardiograma demonstrou fibrilhação auricular, desvio do eixo esquerdo, fraca progressão da onda R e um complexo rS nas derivações precordiais, juntamente com extrassístoles ventriculares. A ecocardiografia transtorácica revelou uma fração de ejeção do ventrículo esquerdo (FEVE) reduzida de 33%, com hipocinesia difusa. O doente ficou internado no Serviço de Cardiologia para continuação de cuidados e estratificação invasiva.
O paciente foi submetido a coronariografia, que revelou doença coronária significativa de dois vasos: Tronco comum sem lesões; artéria descendente anterior (DA) proximal apresentava um grande aneurisma com estenose calcificada subsequente de 70-90%; a artéria coronária direita (CD) tinha uma estenose calcificada de 70-90%. A avaliação funcional com fisiologia coronária confirmou isquemia na DA com RFR de 0,79, enquanto a CD não apresentou isquemia (RFR 0,98).
Dada a gravidade da calcificação na DA, foi realizada ecografia intravascular (IVUS), que revelou calcificação extrema com estenoses antes e após o aneurisma. O aneurisma media cerca 21,05 mm^2, com um diâmetro máximo de 5,71 mm. Foi então decidida a realização de aterectomia rotacional na DA, utilizando uma oliva de 1,5 mm para facilitar a passagem do equipamento e dos stents. A angioplastia envolveu pré-dilatação com um balão não complacente (NC) e a utilização de um balão de corte (3,0 × 6 mm) para modificar a placa calcificada. Foi implantado um stent coberto (3,0 × 12 mm) para cobrir o aneurisma, seguido pela colocação de dois stents farmacológicos sobrepostos (3,0 × 15 mm e 3,5 × 26 mm) para cobrir as restantes estenoses da DA. A pós-dilatação foi realizada para otimizar a expansão dos stents, e a técnica de otimização proximal (POT) foi aplicada com um balão NC de 4,0 × 8 mm. Durante o procedimento, a 1ª diagonal ficou presa nas malhas do stent, necessitando do cruzamento com guia e da dilatação com um balão 2,0 × 12 mm para restabelecer fluxo. O resultado angiográfico final foi excelente, com plena restauração do fluxo na DA e na diagonal.
Este caso destaca a complexidade do tratamento da doença coronária calcificada severa e a importância da utilização de técnicas avançadas, como a aterectomia rotacional e a imagiologia intravascular, para orientar a intervenção e alcançar resultados otimizados.

25. WHEN EVERYTHING GOES WRONG IN A STEMI PATIENT

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Paciente do sexo masculino, 71 anos, com antecedentes de diabetes mellitus tipo 2 e ex-fumador. Teve um acidente vascular cerebral isquêmico em 2009, sem sequelas. Foi admitido no serviço de urgência com dor torácica aguda e diagnóstico de enfarte agudo do miocárdio com supra de ST inferior.
A angiografia coronária inicial revelou uma oclusão completa do segmento médio da artéria coronária direita (6F JR4). Durante o procedimento de intervenção coronária percutânea (ICP), foi observada uma dissecção da artéria coronária esquerda principal após canulação do cateter guia (XBLAD 3.5; 6F), confirmada por ultrassonografia intravascular (IVUS).
O tratamento incluiu aspiração trombótica e pré-dilatação com balão não complacente 3,0 × 20 mm. Foi implantado um stent com fármaco (DES) 3,5 × 48 mm. O paciente manteve estabilidade hemodinâmica durante o procedimento. Um fio-guia adicional foi posicionado na artéria descendente anterior esquerda (LAD) distal, e o IVUS demonstrou que a dissecção não envolvia a LAD e que o fio-guia estava localizado no lúmen verdadeiro. Foi realizada uma angioplastia de resgate com implantação de DES 5,0 × 12 mm, com bom resultado angiográfico, sendo a dissecção selada, confirmada por IVUS.
Na manhã seguinte, o paciente apresentou novo episódio de dor torácica, refratária à terapêutica médica. Decidido realizar cateterismo cardíaco emergente. Angiografia coronária revelou trombose completa do stent previamente implantado. Foi então implantado um novo stent Synergy 3,5 × 28 mm distalmente ao stent anterior. Devido à persistência de trombo intrastent, foi necessário o implante de outro stent DES intrastent, obtendo-se um bom resultado angiográfico final.
Este caso ilustra duas complicações graves no contexto do ICP em pacientes com enfarte agudo do miocárdio: a dissecção da artéria coronária esquerda principal após a canulação do cateter guia, que foi tratada com sucesso, e a trombose do stent, uma complicação potencialmente fatal que requer vigilância contínua e intervenção rápida. O uso de IVUS foi fundamental para a correta orientação e identificação da anatomia coronária, permitindo um tratamento mais preciso.

26. FEMORAL TROUBLE POST-TAVR

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We present the case of a 91-year-old woman, followed in cardiology clinic for symptomatic aortic stenosis. As relevant comorbidities, she had a history of cerebrovascular disease, having had an ischemic stroke which left no major sequelae, and had dyslipidemia, diabetes and obesity as cardiovascular risk factors.
Transthoracic echocardiography revealed a non-dilated left ventricle with preserved ejection fraction, and excluded the presence of other relevant structural heart disease. Coronary angiography excluded the presence of obstructive coronary artery disease.
After treatment plan was discussed and agreed upon with the patient, she was accepted for transfemoral transcatheter aortic valve replacement (TAVR).
The procedure was performed under sedoanalgesia. The right common femoral artery (14 Fr) was used as the main access, having been pre-closed with a Perclose ProStyle system. The left radial artery (5 Fr) was used as the secondary access.
After pre-dilatation with a True Dilatation balloon of 18 mm, an EVOLUT FX 26 prosthesis was implanted. Post-dilatation was performed with a True Dilatation balloon of 21 mm, and aortography revealed the presence of a minor *leak*.

Angiography of the right common femoral artery revealed an occlusion caused by dissection of the vessel wall. Attempts to cross the occlusion ipsilaterally were of no avail. Left superficial femoral artery access (8 Fr) was attained allowing for successful occlusion crossing. Pre-dilation was done with a PASSEO-35 XEO 5 × 40 mm balloon and angioplasty followed, with the implantation of a VIABAHN 9 × 50 mm covered stent. Post dilation with a SABER 7x40mm balloon yielded a favorable angiographic result.
Right superficial femoral access was closed with Perclose Prostyle and Mynx Control devices, and left common femoral artery was closed with an Angio-Seal 6.
The patient was admitted to our Cardiac Intensive Care unit, having had an event-free admission, with no vascular complications upon ambulation. She was discharged under double anti-platelet therapy with clopidogrel and aspirin for a month, followed by life-long single antiplatelet therapy.
This case reports on a femoral artery dissection leading to arterial occlusion, and highlights the importance of searching for these vascular complications, and having different approaches available to troubleshoot their resolution.

27. AN ELUSIVE PRESENTATION OF A TYPICAL CORONARY SYNDROME

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A female patient of 45 years of age, born in Cabo Verde but living in Portugal for over 20 years was urgently admitted for the management of unstable angina. The patient was initially admitted to an internal medicine ward for chest pain that had been evolving in the previous months. The pain was oppressive in quality, starting in the epigastrium and migrating to the chest and throat, and was triggered by minimum effort such as doing domestic chores.
Medication included: perindopril 5 mg, pantoprazole 40 mg, bromazepam 2 mg SOS; captopril 25 mg SOS se PAS > 160 mmHg ou TAD > 100 mmHg.
On admission lab works were remarkable for negative troponin, electrocardiogram depicted normal sinus rhythm with no ST changes and contrasted thoracic CT excluded acute aortic syndrome. The patient was transferred to the cardiology ward to proceed with the clinical investigation and a decision to perform coronary catheterization was made. Coronary angiography showed no lesions on the left main, left anterior descendent (LAD), circumflex and right coronary arteries.
Immediately after the procedure the patient had a new episode of chest pain accompanied by a hypertensive crisis (BP 180/100 mmHg), which reverted with the administration of SL nitroglicerin. The accompanying ECG depicted TWI in V2-V3 when comparing to the baseline ECG.
Additional study through transthoracic echocardiogram showed a LVEF of 61% with no kinetic alterations of the LV walls or relevant valvular alterations. Of note, in the coronary cath an extended study was performed to exclude renal artery stenosis and aortic coartation. Due to lack of acetylcholine, coronary vasospasm study was not performed. The subsequent plan was to exclude common causes of paroxystic high BP (eg: pheocromocytoma) and, subsequently, re-reference to the cardiology service to perform coronary microvascular functional assessment.
Six months later, the patient was re-admitted to perform invasive coronary microvascular assessment. An RFR 0.71 was noted. After exclusion of CA dissection and of diffuse vasospasm, a review of coronary angiogram imaging prompted a focused re-assessment of the LAD artery ostium, which appeared to be compromised. Optical coherence tomography - OCT - imaging confirmed a lesion on the ostium of the LAD, with fibrous characteristics and immediately preceded by cholesterol plaque. Minimum luminal area was 5 mm^2 (reference value >17 mm^2). Due to the highly focal nature of the lesion the patient was proposed to CABG.
The patient ultimately underwent a single vessel left internal mammary artery to the LAD CABG, with complete clinical recovery and remission of angina symptoms.
In this clinical case, physiological study of coronary circulation through the use of RFR indicated that there was a high likelihood for the presence of a clinically significant obstruction that was not detected through traditional coronary angiography interpretation and OCT imaging played a pivotal role in the confirmation of the clinical diagnosis, lesion characterization, and adequate treatment planning. Adequate characterization of coronary artery lesions benefits from the integration of multimodal evaluation including traditional angiography, coronary physiology and intravascular coronary imaging.

28. LATE SPONTANEOUS RUPTURE OF A SAPHENOUS VEIN GRAFT TREATED PERCUTANEOUSLY: A CLINICAL CASE

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Introduction: The occurrence of spontaneous late aortocoronary graft ruptures is a rare complication after coronary artery bypass graft (CABG) surgery, with an incidence of < 1%. We report a case in a 77-year-old male presenting with acute coronary syndrome 22 years after surgery that was successfully treated percutaneously.
Case report: A 77-year-old male presented to the emergency department with a 4-day history of worsening chest pain, malaise, and fatigue. He had a history of ischemic heart disease with triple coronary artery bypass graft surgery in 2001, intracerebral space-occupying lesion for which the patient denied further study, end-stage chronic kidney disease, right bundle branch block and type 2 diabetes mellitus. Upon admission, the patient was hemodynamically stable, with crepitations on pulmonary auscultation. ECG revealed atrial fibrillation, right bundle branch block and inferior ST-segment elevation. Bedside echocardiogram showed preserved biventricular function with no wall motion abnormalities and no pericardial effusion. Inferior myocardial infarction with ST-segment elevation (STEMI) was presumed, loading doses of aspirin and ticagrelor were administered, and the patient was admitted to our department for emergency percutaneous coronary intervention (PCI). Coronary angiography showed occlusion of the three main native coronary arteries, patency of the saphenous-obtuse marginal graft, and a patent left internal mammary graft, no significant lesion in the anastomosis, but diffuse distal disease; regarding the saphenous-posterior descending artery (PDA) graft, there was a 50% proximal stenosis and a distal occlusion, with an abnormal runoff of contrast in the distal anastomosis of the venous bypass, which was thought to correspond to a fistula or an aneurysm of the anastomosis, causing steal phenomenon and weakening the flow to the distal vessel. Balloon angioplasty of the distal native vessel was then performed, with slight flow improvement; no further intervention was performed until additional lesion characterization. A coronary CT angiogram was then performed, showing active bleeding of the venous bypass anastomosis with a hematoma in the pericardial space compressing the right atrium wall. Fresh frozen plasma and fibrinogen were administered, and the case was discussed in the Heart Team, having been decided that, considering the patient's comorbidities, the surgical risk was prohibitive, and the patient was to be treated percutaneously. On the same day, the patient presented with progressive hypotension, with an echocardiogram showing signs of cardiac tamponade. Emergent PCI of the saphenous-PDA graft was then performed with a Xience 3/12 mm stent in the proximal stenosis and two covered stents (Papyrus 4/15 mm and Papyrus 4.5/15 mm) covering the anastomosis segment. Although there was initial clinical improvement, the patient eventually deteriorated with septic shock (elevation of inflammatory parameters, with positive blood cultures for methicillin-resistant *Staphylococcus aureus*). Echocardiographic revaluation showed no signs of tamponade recurrence. Despite antibiotic therapy with piperacillin-tazobactam and vancomycin and vasopressor support, the clinical status progressively declined, and the patient eventually died.
Discussion: Treatment of aortocoronary graft ruptures is challenging and may include open surgical repair, endovascular interventions, or observation. Our case showed angiographic success after placement of Papyrus covered stents.

29. NO STENT

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Doente do sexo feminino, com antecedentes de hipertensão, dislipidemia e obesidade, submetida a coronariografia emergente por enfarte agudo do miocárdio inferior. O diagnóstico evidenciou coronárias ectásicas e presença de trombo na coronária direita (CD) média, com oclusão do vaso. Consequentemente, decidiu-se efectuar angioplastia da CD, com aspiração de trombos com dispositivo 7 F. por manter fluxo TIMI 0, foi efectuada pré-dilatação com balão SC, seguida de nova tentativa de aspiração de trombos. Por manter fluxo TIMI 0, decidiu-se implantar stent 5 × 18 mm. No entanto, o vaso manteve-se com fluxo TIMI 0, razão pela qual foram efectuadas novas aspirações com recurso a cateter AL 7F. Nesta fase, o vaso apresenta melhoria do fluxo, porém ainda com trombos e imagem sugestiva de dissecção da CD distal, a condicionarem fluxo TIMI 0 na RPL. Avançou-se um segundo guia w*ork horse*, através do verdadeiro lumen, e foi realizada dilatação com balão SC 4,0 × 20 mm.

No final do procedimento, apesar do vaso apresentar fluxo TIMI 3, a carga trombótica era ainda elevada, pelo que ficou com perfusão de eptifibatide e indicação para efectuar enoxaparina em dose terapêutica durante o internamento.

Doze horas após a admissão, apresentou recorrência de dor e relevação do segmento ST nas derivações inferiores, razão pela qual foi submetido a novo cateterismo. Apresentava trombose de stent, por mal aposição do mesmo. Por se assumir que não seria possível a adequada aposição do stent foi efectuada explantação do stent subdimensionado da CD com balão NC 5,0 × 20 mm, que se abandonou ao nível da ilíaca direita. Pós- dilatação do stent na ilíaca, com bom fluxo sanguíneo a este nível.

Por apresentar agravamento da dissecção, progressão de fio guia, que avançou através do falso lúmen, que já tinha sido criado no procedimento da véspera. Através da utilização de IVUS, foi possível ganhar o verdadeiro lúmen, com um segundo fio-guia e efectuar insuflações prolongadas com balão de 6 × 30 mm, com recuperação de fluxo e resolução da elevação de ST.

O restante internamento decorreu sem intercorrências, tendo ficado medicada em ambulatório com dupla antiagregação e anticoagulação oral. Um mês mais tarde efectuou reavaliação angiográfica por angioTC coronária, que revelou presença de trombo na CD médiodistal e IVP, que não condiciona estenose significativa (25-50%).

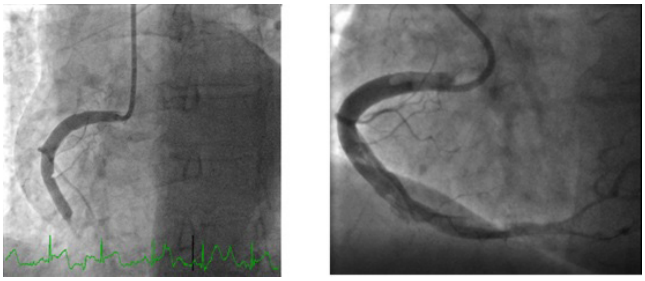

Figura 1.

30. SOMETIMES THE BEST TREATMENT HAS COMPLICATIONS

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Doente do sexo feminino, 67 anos, com história de hipertensão, dislipidémia e tabagismo admitida por enfarte sem elevação do segmento ST. Efectuou coronariografia, que demonstrou doença de 3 vasos - DA média de 100%, crónica (Rentrop 1), circunflexa (cx) proximal 100%, crónica; vaso distal visualizado tardiamente (Rentrop 2), Coronária Direita (CD) proximal de 70%, CD distal de 99%. Efectuada revascularização da CD com 2 stents. Foi posteriormente readmitida para angioplastia da DA. Foi efectuada angioplastia da oclusão crónica da Cx proximal, vaso com doença difusa, até ao TC. Angioplastia efectuada por técnica de *Anterograde Wire Escalation*. Bom resultado inicial após pré-dilatação com balão SC 1,5 × 10 mm, pelo que se optou por aplicação de *drug-elluting balloon* (2,5 × 30 mm). Durante o procedimento, verifica-se dissecção iatrogénica do TC (Figura 1), com patência do fluxo em ambos os ramos da bifurcação. Foi efectuada angioplastia da oclusão crónica da DA média por técnica de *Anterograde Wire Escalation*, com pré-dilatação com balão SC (1,5 × 10 mm), implantação de stent com fármaco 2,5 × 50 mm, e com pós-dilatação com balão NC 2,5 × 20 mm.

Nesta fase, verifica-se progressão retrógrada da dissecção do TC para o seio de Valsalva (Figura 2) e para a Cx (Figura 1), com compromisso do fluxo. Nesse contexto, avançou-se para angioplastia do TC com técnica de mini-culotte: implantação de stent TC/Cx (2,5 × 28 mm), POT com o balão do stent, pré-dilatação do TC (SC 4,5 × 12 mm), *rewiring* da DA, *kissing balloon*, implantação de stent 3,5 × 24 mm do TC/DA, POT com o balão do stent e com NC 4,5 × 8 mm, *rewiring* da Cx, novo *kissing balloon* e POT final do TC com NC 4,5 × 8 mm. Bom resultado angiográfico final, verificando-se encerramento do falso lumen do seio de Valsalva (Figura 3). Posteriormente, ficou internada para vigilância clínica. Durante o mesmo, efectuou AngioTC para avaliação da dissecção, tendo sido objectivada imagem de subtracção intra-aórtica na parede posterior, junto à emergência do TC, compatível com pequena dissecção da raiz da aorta, sem fluxo/permeabilização de falso lúmen - aparentemente em cicatrização. Stent no TC bem posicionado, expandido e permeável.

Oito meses após o procedimento, encontra-se clinicamente assintomática.

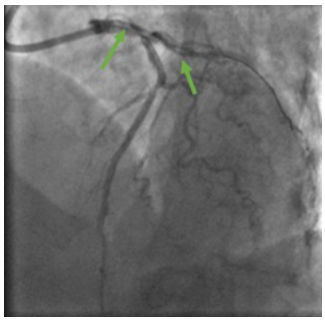

Figura 1.

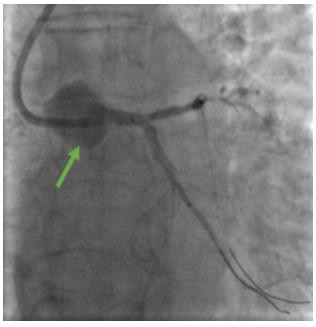

Figura 2.

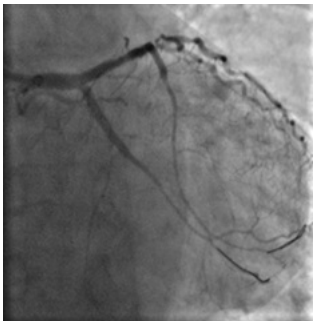

Figura 3.

31. WHEN AN ANOMALOUS CIRCUMFLEX CORONARY ARTERY AND A PROSTHETIC MITRAL VALVE CHALLENGE TRANSCATHETER AORTIC VALVE REPLACEMENT

Ana Raquel Carvalho Santos, Francisco Barbas Albuquerque, André Grazina, Pedro Brás, Catarina Oliveira, Filipa Silva, Pedro Rosa, Dina Almeida, Cristina Fondinho, Vânia Santos, Daniela Carneiro, Ruben Ramos, Duarte Cacela, Rui Cruz Ferreira

Centro Hospitalar Universitário de Lisboa Central, EPE/Hospital de Santa Marta, Lisboa, Portugal

A 73-year-old man was proposed for transcatheter aortic valve replacement (TAVR) due to severe aortic stenosis with mildly reduced left ventricular ejection fraction.
He had history of mitral mechanical valve implantation and tricuspid annuloplasty in 2005, chronic kidney disease and documented Mobitz II in a recent electrocardiogram that prompted pacemaker implantation in May of 2024.
During evaluation for TAVR a coronary CT angiogram showed an anomalous origin of circumflex artery not previous described. The circumflex artery had an origin in the right coronary sinus and a retro aortic trajectory with close proximity to the mitral prosthetic valve, arising a possible challenge in TAVR.
The patient was admitted for TAVR in June of 2024. During the procedure to avoid coronary compression, a protection guide wire was introduced in the circumflex artery. Subsequentially, balloon insufflations were made in aortic valve position without evidence of coronary compression and TAVR was successfully performed. In the end of the procedure the patient developed an escape rhythm and ventricular electrode displacement was noted. A temporary electro catheter was placed through jugular access with posterior revision of pacemaker leads. Afterwards the patient was safely discharged.
Coronary artery anomalies are a congenital condition characterized by either abnormal origin or course of the coronary arteries. The overall prevalence ranges from 0.78% to 5.8%. Most cases do not require further evaluation or intervention if they do not have high risk characteristics for sudden cardiac death. In this case there were no alarming high-risk features. Although, the retro aortic trajectory of circumflex artery and its proximity to the mitral prosthetic valve introduced a serious risk of coronary compression at the time of TAVR.
This case illustrates a patient with severe aortic stenosis and anomalous origin of the circumflex artery that due to his particularities had a serious risk of coronary compression during the procedure, but with careful planning successful TAVR was possible.

32. CONTAINED ANNULAR RUPTURE DURING TAVI PROCEDURE

André Paulo Ferreira, Ana Raquel Santos, Francisco Albuquerque, André Grazina, Pedro Brás, Luís Morais, Tiago Mendonça, Tiago Pereira-da-Silva, Lídia de Sousa, Inês Rodrigues, Rúben Ramos, Duarte Cacela, António Fiarresga, Rui Cruz Ferreira

Centro Hospitalar Universitário de Lisboa Central, EPE/Hospital de Santa Marta, Lisboa, Portugal

Doente do sexo masculino, 81 anos. Transferido para TAVI por EA grave com IC descompensada. Após pós-dilatação da válvula, o doente apresentou quadro de dor torácica súbita intensa e constatou-se rotura do anel aórtico angiograficamente. ETT durante o procedimento a revelar ligeiro derrame pericárdico, estável nas horas seguintes. Após discussão com a cirurgia cardíaca, considerou-se a rotura do anel como contida e optou-se por tratamento conservador. Houve necessidade de pericardiocentese ao fim de 7 dias, com posterior evolução favorável.

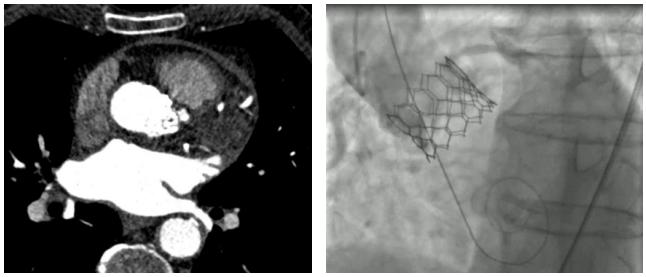

Figura 1.

33. WHEN AN AORTIC VALVE PROSTHESIS IS NOT ENOUGH

Catarina Oliveira, Miguel Nobre Menezes, João Silva Marques, Pedro Carrilho Ferreira, Cláudia Jorge, Tiago Rodrigues, Pedro Pinto Cardoso, Fausto J. Pinto

Centro Hospitalar de Lisboa Norte, EPE/Hospital de Santa Maria, Lisboa, Portugal

A 85 years-old female patient with previous diagnosis of arterial hypertension, diabetes, obesity, permanent atrial fibrillation and chronic kidney disease, presented with symptomatic aortic stenosis. After a coronary angiography without evidence of coronary artery disease and a thoracoabdominopelvic computed tomography without major femoral arteries calcification, the patient was schedule to a transfemoral transcatheter aortic valve replacement (TAVR).
The procedure was performed under sedoanalgesia. The right common femoral artery (14 Fr) was used as the main access, and the left femoral artery (6 Fr) as the secondary one. After pre-dilatation with a True Dilatation balloon of 20 mm, an ACCURATE NEO S prosthesis was implanted. Post-dilatation was performed with a True Dilatation balloon of 21 mm. During the removal of the SAFARI guidewire, embolization of the prosthesis to the ascending aorta was observed, with hemodynamic stability maintained. Using a pitgtail catheter, a standard 0.035 J wire was passed inside one of the axial stabilization arches of the prosthesis, using the left femoral access. A second J-wire was then introduced via the right femoral artery sheath (iSleeve). A new iSleeve was then placed via the Safari wire and a new 6Fr sheath was placed in the same access entry point side by side. A three-loop EN Snare was deployed with an MP 1 guide catheter via this new access and the J-wire was snared, effectively producing a lasso around the prosthesis axial stabilization arch. The prosthesis was positioned and stabilized in the ascending aorta. A pigtail was passed inside the first prosthesis. Then, a second SAFARI S guidewire was again placed in the left ventricle. A second ACCURATE NEO S valve was implanted in the aortic position. The final aortography revealed a mild leak. Finally, the first valve was released in the ascending aorta. The right femoral access was closed with 2 Perclose Proglide and an AngioSeal 8 Fr, and the left femoral access was closed with AngioSeal 6 Fr. The patient was admitted to the Cardiac Intensive Care Unit, remained hemodynamically and electrically stable throughout the hospitalization, and was discharged 72 hours after the procedure. At 1 month of follow up, she is in NYHA I, asymptomatic and without cardiovascular events.
This case highlights the importance of a correct planning for a successful and complication free procedure, as well as the need of bailout techniques knowledge for ensuring a safe procedure. While self-expandable valves can be snared if distal embolization occurs, snaring differs according to prosthesis model. While the CoreValve family enables direct snaring because of the presence of paddles, the Accurate family is more challenging, but nevertheless feasible. It is important to remember that when self-expandable transcatheter aortic valves are used, a snare is needed in case of valve embolization.

34. TIME-BOUND HEARTS: PALLIATIVE VALVULOPLASTY IN A RARE PROGERIA CASE

Diana Ribeiro

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32-year-old male with Hutchinson-Gilford Progeria, peripheral vascular disease, multivalvular disease and severe frailty (BMI 14.5 kg/m^2) admitted to the Cardiology Department presenting clinical signs of decompensated heart failure. His last echocardiogram revealed severe aortic stenosis (estimated peak systolic transvalvular aortic gradient 37 mmHg, mean gradient 24 mmHg, functional valve area of 0.5 cm^2 and a Doppler velocity index of 0.26), mild to moderate aortic regurgitation, moderate to severe mitral valve disease and severe tricuspid regurgitation with pulmonary hypertension.

The patient had previously been considered for valve replacement surgery but was declined by two surgical centers due to prohibitive surgical risk. Given the lack of significant improvement with pharmacological measures during hospitalization, percutaneous valve intervention (TAVI) was proposed but again declined. Consequently, after a multidisciplinary team discussion, considering the patient's overall risk, previous refusals by surgical centers, and refractory clinical condition, the decision was made to proceed with percutaneous aortic valvuloplasty as a palliative measure for symptomatic relief.

The procedure commenced with right brachial arterial access for aortography and ultrasound-guided left femoral arterial and venous accesses. Valvuloplasty was conducted using a NuMED Z-MED II 12 mm balloon under tachypacing. Final aortography revealed mild to moderate aortic/left ventricular regurgitation with no evidence of mechanical complications. Hemostasis was achieved by manual compression of the right brachial artery, closure of the left femoral artery with Prostyle, and manual compression of the left femoral vein.

The patient demonstrated favorable clinical progress with no complications during the remain hospitalization.

Hutchinson-Gilford Progeria Syndrome (HGPS) is an extremely rare autosomal dominant disorder with premature aging and progressive atherosclerosis, typically managed conservatively for severe aortic stenosis[1], though some cases have shown favorable outcomes with percutaneous valve intervention[2]. Percutaneous aortic valvuloplasty (PAV) is a minimally invasive procedure that temporarily relieves symptoms of severe aortic stenosis in patients who are ineligible for surgical valve replacement or TAVI, or as a bridge to definitive therapy[3]. Although PAV is no longer a first-line treatment, it remains essential for symptom relief and quality of life improvement, especially in palliative settings. Despite its typically short-lived benefits due to restenosis, PAV is crucial for managing symptoms in high-risk patients with limited life expectancy where the focus is on symptom control rather than long-term survival. This case demonstrates the feasibility of a percutaneous valve intervention technique in patients with poor prognosis conditions and in palliative stages.

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35. REPOSITIONING OF MITRAL PLUG FOR CLOSURE OF MITRAL LEAK COMPLICATED BY DISC OBSTRUCTION

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Introduction: Paravalvular prosthetic leak (PVL), a potentially severe condition, arises from the deterioration of annular tissue and occurs in 6% to 15% of surgically implanted prosthetic valves[1]. When accompanied by large jets, they can result in severe heart failure, while even small jets have the potential to cause hemolysis. Factors contributing to the occurrence of PVL include tissue friability, infection, and valvular ring calcification. Mitral valve replacement, particularly with mechanical prostheses, is associated with a higher[2]. Surgical repair was once the primary approach for treating PVL, with percutaneous treatment reserved for patients at high surgical risk. Given that many of these patients have significant comorbidities, they are often deemed high-risk candidates for repeat surgery. Consequently, percutaneous catheter-based closure has become the preferred approach as experience with various devices for this purpose has grown. Prosthetic impingement is a considerable potential complication in percutaneous repair procedures. Therefore, the feasibility for percutaneous closure must be assessed by defining the shape, size and location of the defect. When this occurs despite repeat attempts at extruding the device through the delivery catheter, smaller devices should be attempted[3].

Case report: A 73-year-old male with a history of mitral valve replacement using a St. Jude 29 mechanical prosthesis in 2009, due to rheumatic disease, presented in 2022 with symptoms of congestive heart failure. A transesophageal echocardiogram (TEE) revealed a severe paravalvular leak adjacent to the lateral wall of the left atrium, accompanied by systolic flow reversal in the pulmonary veins. Despite initial efforts to optimize medical therapy, the patient remained in NYHA class II. After a multidisciplinary review, percutaneous closure was approved, considering the patient's oncological comorbidities. The procedure was partially successful, with increased gradients resulting from interference with the prosthesis and a persistent moderate lateral leak. Nonetheless, the patient experienced slight improvement, allowing for continued optimization of medical management. In 2024, the patient's congestive symptoms worsened, prompting a proposal for another attempt at closing the paravalvular leak under general anesthesia, using fluoroscopy and TEE to guide the procedure. The approach was once again an anterograde transseptal route via femoral venous access, chosen due to the lateral wall location of the jet, making this technique preferable over the transapical approach, which is typically used for jets closer to the interatrial septum. The mitral valve was crossed using a hydrophilic guidewire (Agilis, St. Jude). Two 12 × 5 mm Amplatzer Vascular Plug III (AVP III) devices were sequentially implanted, based on measurements obtained via TEE, resulting in an improvement of the regurgitation to a mild level. However, after releasing the devices, an obstruction of one of the prosthetic discs was noted, which could only be temporarily relieved using the Agilis sheath and balloon, leaving the patient with high gradients, The decision was made to keep the devices in place and reassess the situation. Due to worsening symptoms, a correction of the mitral plug was performed, with repositioning of the device more atrially doing a snare of the atrial side of the target device, repositioning it further into the atrium. The TEE showed sustained relief of the prosthetic disc obstruction, and the patient experienced symptomatic improvement, allowing for continued outpatient follow-up.

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36. PATENT FORAMEN OVALE: A CLINICAL AND TECHNICAL CHALLENGE

Mariana Pereira Santos, André Alexandre, David Sá Couto, Diana Ribeiro, Ricardo Costa, Raquel Baggen Santos, Bruno Brochado, André Luz, João Brum Silveira, Severo Torres

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A 77-year-old female patient with a history of hypertension, total right hip replacement, and peripheral venous disease was admitted for elective surgery to correct acetabular displacement. The procedure was uneventful, however, severe respiratory insufficiency and altered mental status

developed after extubation, requiring reintubation and admission to the Intensive Care Unit (ICU). There were no signs of heart failure, infection, or pulmonary embolism. The patient desaturated in a slight upright position and these episodes were exacerbated when Positive End-Expiratory Pressure (PEEP) was set at 10 cmH_2O but improved with PEEP reduced to 5 cmH_2O. Further investigation revealed multiple ischemic strokes affecting different cerebral territories. These findings suggested right-to-left shunting.

Transthoracic and transesophageal echocardiography (TEE) confirmed the presence of a patent foramen ovale (PFO) with septal aneurysm (excursion of 15 mm), a large tunnel (16 × 6 mm) and lipomatous atrial septal hypertrophy (LASH, 14 mm) [A]. Color Doppler imaging revealed right to the left shunt, and there was early passage of bubbles.

The patient was referred for PFO closure. Initial right heart catheterization excluded pulmonary hypertension. The procedure started with a right femoral venous access and was guided by TEE. An initial attempt to close the PFO with an Amplatzer™ Talisman 35 mm PFO device was made. However, the initial implantation was unsuccessful due to unsatisfactory disc apposition with residual shunt [B]. Balloon-sizing with an Amplatzer™ Sizing Balloon was performed, revealing a waist diameter of 13-14 mm. Following this, an Amplatzer™ Septal Occluder 15 mm was implanted, achieving well-adapted placement without residual shunt [C]. There were no immediate or late complications, and the patient was started on dual antiplatelet therapy (for three months). The hospital stay was prolonged due to infectious and neurological complications, leading to discharge on day 191 post-admission. The patient is alive at 6-month follow-up, with no hypoxemia or new embolic events.

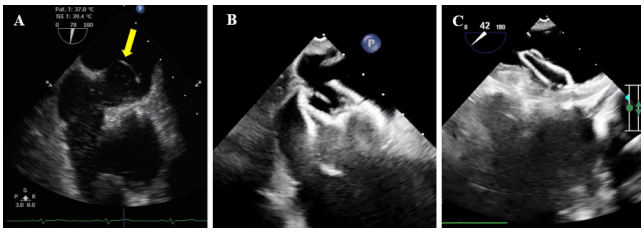

Figura 1.

This case highlights an often-forgotten cause of desaturation in the ICU: platypnea/orthodeoxia (POD). It may follow positive pressure ventilation, due to augmented right atrial pressure leading to the opening of the foramen ovale[1]. Stroke related to a PFO is a well-established indication for closure in specific clinical and anatomical scenarios. In addition to this, PFO closure is also recommended for patients presenting with platypnea-orthodeoxia syndrome (POD)[2,3].

Also, it underscores that atrial septal aneurysm, LASH, and long-tunnel PFOs present challenging features for percutaneous closure. In these cases, balloon-sizing may be useful in determining the defect size and, sometimes, a smaller self-centering device might be better than a larger PFO septal occluder.

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37. THE HYBRID PROCEDURE: A GOOD SOLUTION

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Introdução: A implantação de stent no canal arterial (CA) em doentes com cardiopatias cianóticas com circulação pulmonar dependente de CA associa-se a uma redução do risco comparativamente à criação de shunt sistémico-pulmonar cirúrgico. No entanto, nem todos os CA são adequados para a implantação de stent e nem todas as intervenções são seguras ou garantem resultados favoráveis. A evidência científica sobre implantação de stent em CA tortuoso é escassa, sendo essencial a selecção criteriosa de doentes para esta técnica. Apresentamos o caso de um recém-nascido portador de atrésia das válvulas tricúspide (AT) e pulmonar (AP) associadas a ventrículo direito (VD) hipoplásico, no qual se realizou a implantação de stent no CA por abordagem híbrida.

Caso clínico: Recém-nascido do sexo masculino, com diagnóstico pré-natal (DPN) de AT, AP e VD hipoplásico, com irrigação pulmonar assegurada retrogradamente por CA longo e tortuoso. O estudo genético invasivo foi negativo. O parto ocorreu às 35 semanas de idade gestacional (peso 1.910 g), confirmando-se ecocardiograficamente o DPN. Apresentava CA patente, sigmóide, a irrigar retrogadamente as artérias pulmonares (AAPP) e comunicação interauricular ampla. Iniciou PGE_1, que manteve, apresentando SpO_2 > 85%. O angio-TC cardíaco denotou CA com topos aórtico e pulmonar de 2,2 mm e 2 mm, respectivamente, com trajecto sigmóide e calibre máximo de 3,1 mm na sua porção proximal/média; TP e AAPP hipoplásicas. Aos 36 dias de vida, (peso 2.695 g), foi submetido a procedimento híbrido, com exposição cirúrgica da artéria subclávia esquerda. Após punção, foi colocado introdutor 4Fr e progredido cateter JR através da aorta (Ao) transversa, CA e TP. A aortografia mostrou CA de morfologia complexa, com duas curvas e índice de tortuosidade > 0,5 (Figuras 1 e 2). Implantou-se um stent com sirolimus e polímero bioabsorvível (Ultimaster Nagomi™) de 18 × 3,5 mm, com *jailing* na artéria pulmonar esquerda (APE) de cerca de 3 mm, que foi dilatado na porção proximal com balão não complacente (Emerge NC™) de 3,5 × 8 mm. A angiografia de controlo mostrou posição adequada do stent e patência do CA (Figura 3). Posteriormente, suspendeu PGE_1, mantendo SpO2 > 85%, e inicou heparina não fraccionada (2 dias) e anti-agregação dupla com ácido acetilsalicílico e clopidogrel, que mantém. Permaneceu clinicamente estável e teve alta aos 52 dias de vida, com stent bem posicionado no CA, a protruir para a APE, com gradiente máximo de 58 mmHg e médio de 36 mmHg, boa função do ventrículo esquerdo e fluxo laminar na Ao. À data, tem 4 meses e pesa 4.500 g.

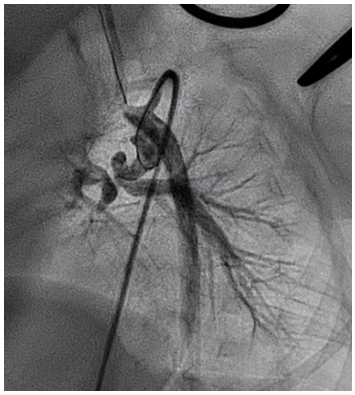

Figura 1. *Angiografia em oblíqua anterior esquerda que mostra a dupla curva do CA.*

Figura 2. *Angiografia em antero-posterior onde se observa o CA tortuoso e as AAPP e os seus ramos.*

***Figura 3**. Angiografia em antero-posterior de controlo com stent em posição adequada e patência do CA.*

Discussão: A implantação de stent em CA tortuoso é uma alternativa eficaz para a paliação de doentes pediátricos com circulação pulmonar dependente de CA, contudo algumas características anatómicas tornam este procedimento mais desafiante. Nestes casos, é essencial a discussão em equipa multidisciplinar para decisão da melhor abordagem, uma vez que pressupõe um planeamento minucioso, disponibilidade de material adequado à anatomia, profissionais experientes, além de uma cooperação contínua da equipa para assegurar a segurança e sucesso do procedimento.

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38. WAIT AND SEE...

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Introdução: A persistência do canal arterial (PCA) é uma cardiopatia congénita comum, com incidência de aproximadamente 0,05 %. O seu diagnóstico é feito na maioria dos casos durante a infância, podendo, no entanto, ser diagnosticada mais tardiamente, nomeadamente, na vida adulta. Actualmente, o encerramento percutâneo é o *gold-standard* para o tratamento na maioria dos casos. A PCA é classificada consoante a sua morfologia, e esta influencia preponderantemente a seleção do dispositivo de encerramento mais adequado. Sendo um procedimento seguro, as complicações graves são raras, sendo a mais frequente a embolização do dispositivo. A evidência científica a longo prazo é ainda escassa, mas a médio prazo os resultados são bastante promissores.

Caso clínico: Criança do sexo feminino, de 2 anos de idade (peso 14 kg), seguida em consulta de Cardiologia Pediátrica por PCA. Do exame objectivo destacava-se a presença de sopro contínuo ("em maquinaria") audível na região infra-clavicular esquerda. No ecocardiograma transtorácico (ETT) observou-se PCA com fluxo contínuo de alta velocidade e diâmetro mínimo de 2 mm, associado a dilatação ligeira das câmaras esquerdas. Foi realizado cateterismo cardíaco para encerramento percutâneo do canal arterial. A angiografia da aorta transversa mostrou a presença de canal arterial longo com cerca de 7 mm de comprimento, 3 mm na ampola aórtica e 1,5 mm no topo pulmonar (Figura 1). Foi implantado um dispositivo de 4 × 6 mm (Amplatzer™ Duct Occluder II) por via anterógrada, obtendo-se posição adequada (Figura 2). Cerca de 2 minutos após a libertação do dispositivo verificou-se oscilação do disco aórtico no lúmen (Figura 3). O ETT de controlo mostrou disco pulmonar em posição correcta, sem oscilação; disco aórtico com oscilação no lúmen, curva doppler com prolongamento diastólico e velocidade máxima de 3,2 m/s. Foi decidida uma atitude expectante e repetição de fluoroscopia no dia seguinte, que revelou dispositivo bem implantado, sem o movimento de oscilação no lúmen da aorta descendente previamente registado. Fez também radiografia de tórax que confirmou o normoposicionamento do dispositivo. Repetiu também ETT, observando-se ligeira aceleração e turbulência do fluxo anterógrado na aorta descendente, exclusivamente sistólico, com velocidade máxima de 1,5 m/s e ausência de prolongamento diastólico. Teve alta nesse mesmo dia e um mês pós-intervenção encontra-se clinicamente bem, estando agendada realização de ETT de seguimento aos 6 meses.

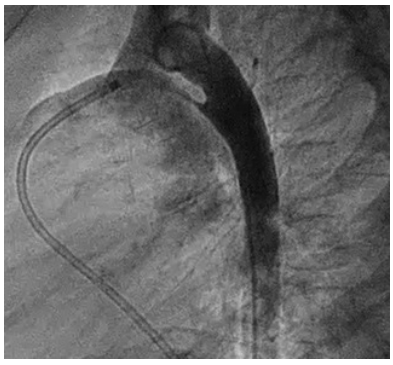

***Figura 1**. Aortografia na aorta transversa mostrando PCA.*

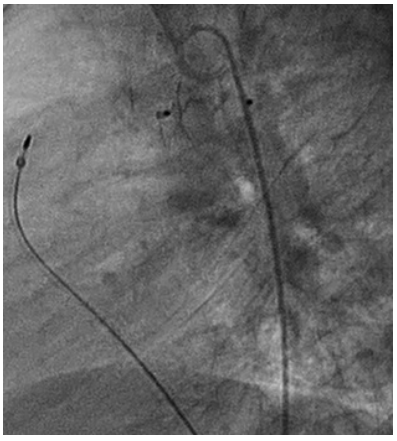

***Figura 2**. Dispositivo de encerramento no canal arterial em posição adequada.*

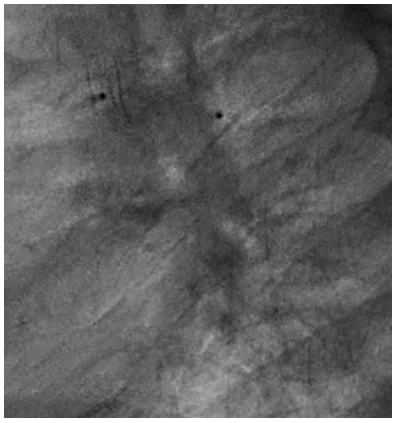

***Figura 3**. Disco aórtico do dispositivo a fazer protusão para o lúmen da aorta descendente.*

Discussão: O encerramento percutâneo de PCA é seguro e eficaz. A protusão de dispositivo para o lúmen da aorta é uma complicação conhecida, embora rara. Apesar da protusão ser geralmente resolvida com o crescimento, pode condicionar obstrução ao fluxo aórtico. Quando identificada durante o procedimento, o dispositivo pode ser reposicionado ou removido se não for possível obter o posicionamento adequado. Neste caso a protusão do disco ocorreu após a libertação do dispositivo, tendo sido decidida uma atitude expectante. Esta estratégia revelou-se uma boa opção, uma vez que o dispositivo se adaptou à anatomia e a protusão desapareceu em menos de 24 horas.

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39. TRAPPED BY THE PERICARDIUM: A CASE OF CONSTRICTIVE PERICARDITIS

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Introduction: Constrictive pericarditis is a rare and challenging diagnosis, often presenting with non-specific symptoms and mimicking other forms of heart failure. It is crucial to differentiate constrictive pericarditis from other causes of right-sided heart failure due to its potentially curable nature.
Case report: We present the case of a 75-year-old male, autonomous in his daily activities and residing in a camping park, with a history of hypertension and peripheral venous insufficiency. He presented to the cardiology clinic with complaints of progressive fatigue over the past year and worsening dyspnea on exertion for the past four weeks. The patient denied any history of pericarditis, fever, weight loss, or chronic cough and had no regular medical follow-up. He was admitted to the hospital with decompensated heart failure, manifesting as generalized anasarca, predominantly right-sided, and hyponatremia (Na 124 mmol/L). Initial treatment with oral furosemide, spironolactone, and metolazone resulted in reduced edema, though signs of congestion persisted. Despite remaining hemodynamically stable and afebrile, the detection of pericardial calcification raised suspicion of constrictive pericarditis. Anticoagulation with apixaban, started for atrial fibrillation, was suspended due to these findings. Following further evaluation, intravenous diuretics were continued, leading to euvolemia and normalization of renal function and serum sodium levels. Anticoagulation was resumed with enoxaparin, and rheumatology was consulted due to suspected rheumatoid arthritis, though no immediate specific therapy was required. Extensive diagnostic tests were performed. An ECG showed atrial fibrillation at 65 bpm, low QRS amplitude, poor R-wave progression, and signs of right atrial enlargement. Chest X-ray revealed an increased cardiothoracic index, pericardial and aortic arch calcifications, and pulmonary congestion with bilateral pleural effusion. Laboratory tests showed mild hyponatremia, elevated NT-proBNP, and a positive rheumatoid factor. Serum protein electrophoresis raised concerns about a plasma cell disorder, later excluded. A transthoracic echocardiogram revealed a non-dilated left ventricle with mildly thickened walls and preserved systolic function, a severely dilated left atrium, and calcified aortic valve with restricted opening. A chest CT confirmed extensive pericardial calcification and moderate pleural effusion without consolidation. Right and left heart catheterization revealed elevated right atrial pressures, equalization of diastolic pressures in both ventricles, and pulmonary hypertension, suggestive of constrictive pericarditis. Transesophageal echocardiography further showed moderate aortic stenosis, mild to moderate mitral and tricuspid regurgitation, and marked biatrial dilation. The patient was diagnosed with constrictive pericarditis, likely of unknown etiology, possibly related to connective tissue disease. He also had mild pulmonary hypertension, moderate aortic stenosis, and tricuspid regurgitation due to septal leaflet prolapse. Surgical pericardiectomy, with potential valvular intervention, was proposed, and the patient is currently awaiting surgery.

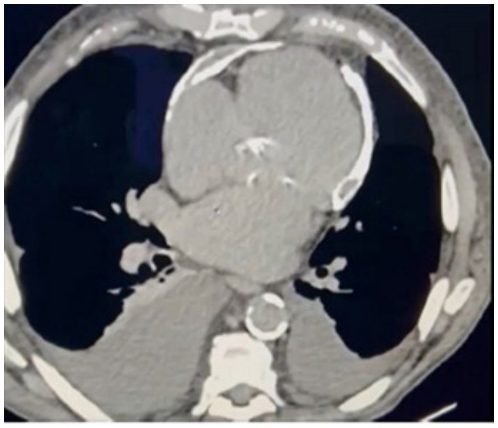

Figura 1.

Figura 2.

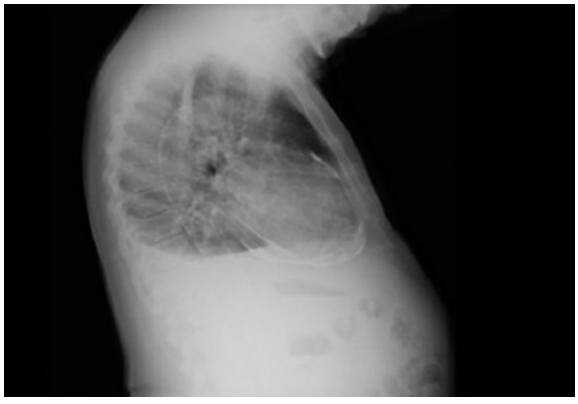

Figura 3.

Discussion: This case emphasizes the importance of comprehensive evaluation in patients with suspected constrictive pericarditis. Multimodal

imaging and hemodynamic studies are critical for accurate diagnosis. Early recognition and timely surgical intervention can significantly improve outcomes in these patients.

40. NAVIGATING SEVERE CALCIFICATION IN TAVI_PROCEDURAL CHALLENGES AND SOLUTIONS

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An 86-year-old man was admitted to the Cardiology Unit with symptoms of congestive heart failure. His medical history included atrial fibrillation, prior permanent pacemaker implantation for complete heart block, and peripheral artery disease. Physical examination revealed low peripheral oxygen saturation, for which oxygen supplementation was provided.
The electrocardiogram indicated atrial fibrillation with ventricular pacing at 80 bpm. Laboratory results showed elevated troponin T and NT-proBNP levels. Transthoracic echocardiography (TTE) revealed a mildly dilated and hypertrophied left ventricle with severely reduced systolic function (LVEF 30-32%, GLS -4.5%) due to global hypokinesia and intraventricular desynchrony. Degenerative aortic valve changes were noted, leading to severe low-flow, low-gradient stenosis (Vmax 3.39 m/s, mean gradient 29.8 mmHg, SVi 33.8 ml/m^2, AVA 0.87 cm^2, AVAi 0.48 cm^2/m^2) with moderate regurgitation. Pulmonary artery systolic pressure was estimated at 27 mmHg. The patient was diagnosed with acute decompensated heart failure secondary to severe aortic stenosis. Heart catheterization showed no significant left coronary artery lesions and mild disease (< 50%) in the right coronary artery. Cardiac computed tomography revealed marked calcification in the aortic and femoral vessels, with a minimum diameter (> 5 mm) suitable for percutaneous treatment. The estimated EuroScore II was 5.84%. A multidisciplinary Heart Team recommended transcatheter aortic valve implantation (TAVI) due to the patient's age, comorbidities, and life expectancy.

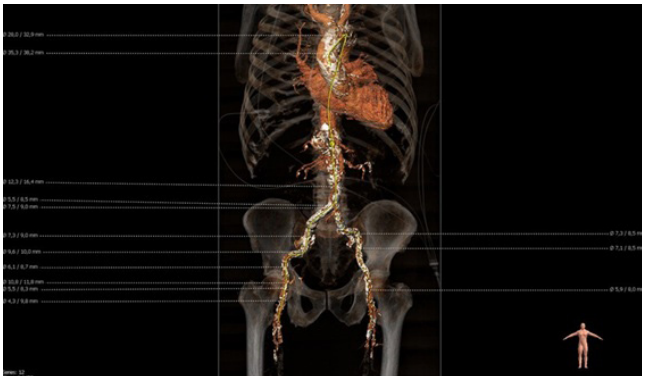

***Figure 1**. Cardiac and vascular computed tomography showing significant calcification in the aortic and femoral vessels, with a minimum diameter greater than 5 mm, making it suitable for percutaneous treatment.*

The procedure was performed under conscious sedation using double transfemoral access. Primary access was through the right common femoral artery, and secondary access through the right superficial femoral artery. An Amplatz Extra Stiff guidewire (Cook Medical) was advanced through the primary access without resistance. Following guidewire positioning, a series of balloon angioplasties with 7.0/60 and 8.0/60 balloons were attempted, but both ruptured. Elective lithotripsy with a 7.0/60 balloon was then performed, with 8 applications. Despite multiple attempts, advancing a 14F e-sheath through the right common iliac artery was difficult, requiring further balloon angioplasty and lithotripsy. Eventually, after repeated maneuvers, the e-sheath was advanced beyond the aortoiliac bifurcation. The Edwards SAPIEN 3 29.0 mm valve (Edwards Lifesciences) was successfully implanted after navigating the tortuous aorta with significant friction.

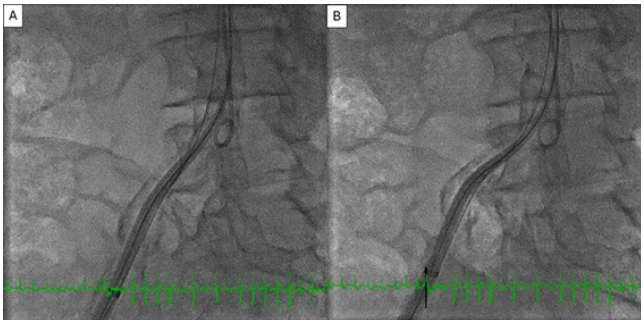

***Figure 2A and 2B**. Intraprocedural fluoroscopy showing significant calcification in the aortic-iliac vessels, with extreme difficulty advancing the 14F e-sheath.*

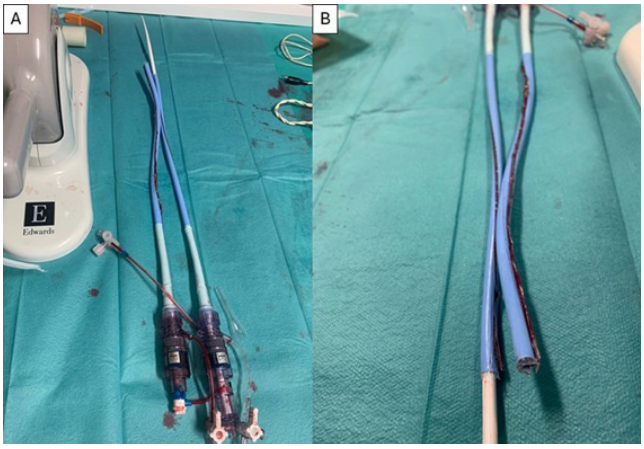

***Figure 3A and 3B**. Images of both 14F e-sheaths used during the procedure, showing significant damage to the tips caused by intravascular calcium.*

Closure of the right common femoral artery was achieved with an 18F MANTA device (Essential Medical), while the secondary left superficial femoral artery was closed using 6F StarClose (Abbott Vascular). The procedure lasted 3 hours, with significant challenges due to severe aortoiliac calcification and tortuosity. Hemodynamic and angiographic success was achieved without immediate complications.
The patient recovered fully without complications and was discharged on oral anticoagulation. Follow-up echocardiography confirmed normal prosthetic valve function with a mild posterior leak. This case highlights the importance of thorough pre-procedural planning, careful intraoperative management, and close monitoring of potential complications in patients with significant vascular calcification and tortuosity during TAVI.

41. HYBRID CABG AND TAVI PROCEDURE_BEST OF BOTH WORLDS

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An 83-year-old man was admitted to the Cardiology Unit for invasive evaluation of unstable angina. He reported worsening dyspnea over six months, along with frequent dizziness and syncope upon standing. His

medical history included hypertension, hypercholesterolemia, a myocardial infarction 26 years prior, and pulmonary silicosis due to occupational exposure, with pulmonary nodule resection four years earlier.
Coronary angiography revealed a critical lesion in the distal left main artery bifurcation and severe in-stent restenosis in the proximal and mid-left anterior descending artery. Transthoracic echocardiography (TTE) showed a moderately reduced left ventricular ejection fraction (LVEF 35-40%) and low-flow, low-gradient aortic stenosis (SVi 27 ml/m^2, mean gradient 29 mmHg, AVA 0.68 cm^2). During hospitalization, the patient experienced recurrent angina and was transferred to a cardiac surgical center for further evaluation.
A multidisciplinary Heart Team assessed the case. Despite his advanced age, comorbidities, and a EuroSCORE II of 6.40% for isolated coronary artery bypass grafting (CABG), his cognitive function, complex coronary anatomy, and availability of hemodynamic support made him a suitable candidate for CABG. However, treating aortic stenosis surgically carried a higher risk, with a EuroSCORE II of 10.61% for combined coronary and aortic valve procedures. Pre-procedural computed tomography confirmed excellent vascular access for transcatheter aortic valve implantation (TAVI) via a transfemoral approach, without significant contraindications. TAVI was thus chosen to treat the aortic stenosis, avoiding the need for cardiac arrest.
Given the patient's reduced LVEF and risk of hemodynamic instability, meticulous planning was essential. The CABG could be performed off-pump with cardiopulmonary bypass (CPB) as a bailout option, while transfemoral TAVI could be backed up with extracorporeal membrane oxygenation (ECMO). To combine the advantages of both procedures and minimize risks, a hybrid approach was selected. This included CABG and transaortic TAVI with CPB as a bailout. The hospital's hybrid operating room with high-quality fluoroscopy supported this strategy.

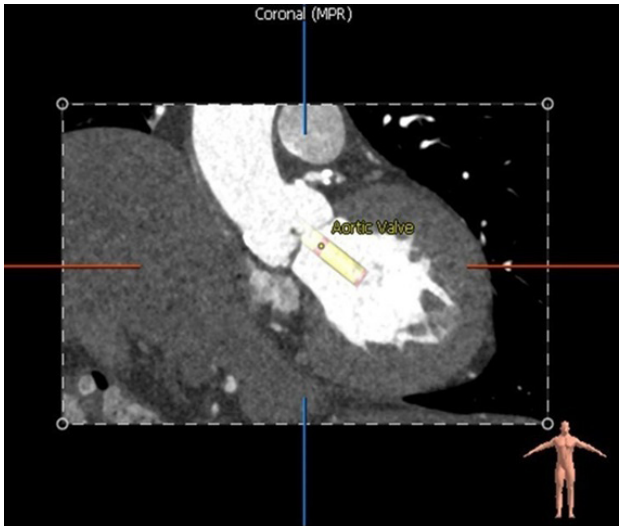

***Figure 1**. Cardiac CT scan in the coronal view used for pre-procedural transaortic TAVI planning.*

The patient underwent CABG × 2 (left internal mammary artery to the left anterior descending artery and saphenous vein to the left marginal artery) followed by transaortic implantation of a 29 mm Edwards Sapien Ultra® balloon-expandable valve. The procedure was successful, meeting both hemodynamic and angiographic goals without immediate complications. Post-procedural TTE showed a normally functioning prosthetic aortic valve with a mild anterior leak and a partially recovered LVEF (50%). After three days, the patient was transferred to his local hospital and discharged one day later. One month post-procedure, follow-up was uneventful, with no readmissions.
A hybrid procedure leverages the strengths of both approaches: CABG offers a safer solution for complex coronary anatomy with CPB as a backup for hemodynamic instability, while TAVI provides a less invasive alternative for aortic stenosis without requiring cardiac arrest.

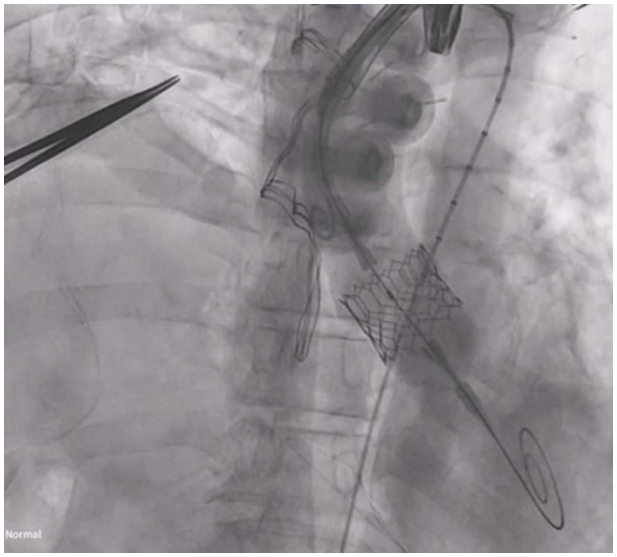

***Figure 2**. Fluoroscopy showing transaortic TAVI implantation following CABG.*

42. EVOLVING RISK. A CASE OF INTERMEDIATE TO HIGH-RISK PULMONARY EMBOLISM

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Introduction: A 74-year-old woman presented to the emergency department with fatigue and dyspnea persisting for two weeks. The patient had a history of a right nephrostomy for renal lithiasis and was undergoing neoadjuvant chemotherapy for invasive breast carcinoma. Physical examination revealed mild tachycardia (heart rate 90-110 bpm), with normal blood pressure (120/70 mmHg) and peripheral oxygen saturation (99%) in room air. There were no signs of peripheral deep vein thrombosis.
Case report: The ECG indicated sinus tachycardia with a left anterior fascicular block. Laboratory analyses showed elevated troponin T and NT-proBNP levels, hypocapnia, and mildly elevated lactate. TTE revealed preserved LV function with mild systodiastolic interventricular septum D-shape, mildly dilated and depressed RV function, and an estimated PASP of 61 mmHg. Additionally, a large mobile thrombus was found in the right atrium extending to the RV. CTPA confirmed pulmonary embolism (PE) with a high bilateral thrombotic burden. The estimated PESI score was 124 points (class IV), placing the patient at an intermediate-high risk for early mortality. The case was discussed with a multidisciplinary Pulmonary Embolism Response Team (PERT) and, considering the clinical stability of the patient, an initial conservative strategy including anticoagulant therapy with unfractionated heparin (UFH) under intensive care unit monitoring was chosen. Twenty-four hours later the patient developed sudden cardiac arrest followed by obstructive shock, requiring non-invasive ventilatory and vasoactive support. Repeat TTE showed a dilated RV and no signs of the previous right atrial thrombus, suggesting probable embolization. Systemic thrombolysis with alteplase infusion was initiated. Repeat CTPA showed a new-onset saddle thrombus in the pulmonary artery bifurcation, supporting the hypothesis of thrombus migration. After rediscussion with the PERT, the patient underwent successful emergent percutaneous thrombectomy, which was uneventful, and allowed a complete hemodynamic recovery and echocardiographic normalization in the first 48 hours. The patient was discharged under oral anticoagulation with apixaban, without further thromboembolic complications during follow-up.

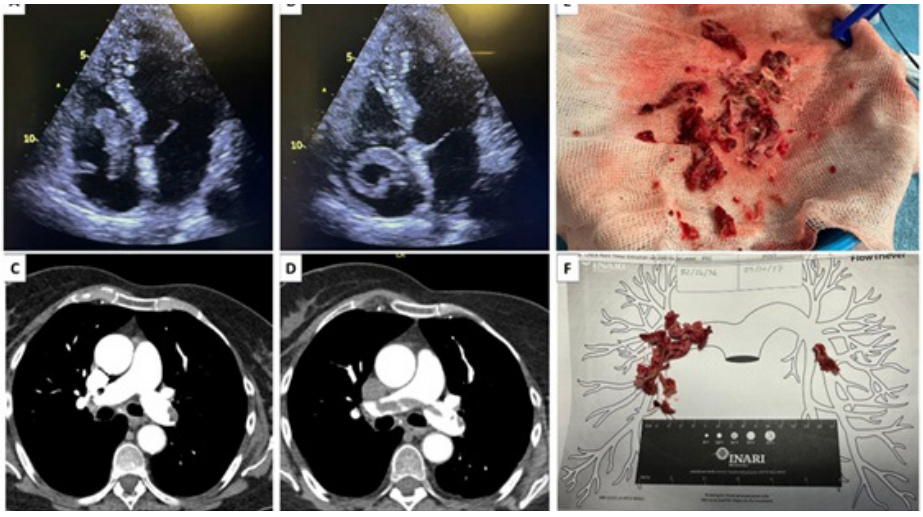

***Figure 1**. (A) and (B) TTE showing a large mobile thrombus in the right atrium. (C) Initial CTPA showing bilateral PE. (D) Repeat CTPA showing bilateral PE with a new-onset saddle thrombus in the pulmonar artery bifurcation. (E) and (F) Thrombus removed during pulmonary thrombectomy.*

Discussion: This case illustrates the dynamic nature of pulmonary embolism management, particularly in the context of right-heart mobile thrombus. It underscores the pivotal role of acute PE programs, multidisciplinary collaboration, and the necessity of meticulous monitoring and timely intervention to optimize patient outcomes.

AGRADECIMENTO AOS AVALIADORES

Em nome da comissão organizadora da 15.ª Reunião Anual da APIC, expressamos a nossa gratidão a todos os avaliadores dos trabalhos concorrentes ao Prémio Jovem Cardiologista de Intervenção. A vasta experiência e espírito crítico do painel de avaliadores, resultaram numa cuidada avaliação dos casos clínicos submetidos, o que se traduziu numa contribuição fundamental para a atribuição deste prémio, promovendo uma vez mais a excelência da cardiologia de intervenção nacional. A todos, o nosso bem-haja.

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