Retrograde angioplasty via pedal access. Progressive escalation strategy

Angioplastia retrógrada por acceso pedio. Estrategia de escalamiento progresivo

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ABSTRACT

Various health organizations and scientific societies have recognized the problem of peripheral vascular disease. The availability of smaller diameter devices, greater navigability, and specific design has allowed us to solve technically challenging cases. These tools allow the interventional cardiologist to use new strategies and improve their results. We present 3 case reports where we apply what we call pedal retrograde angioplasty with progressive escalation strategy.

Keywords: Peripheral vascular disease. Pedal access.

RESUMEN

Diversas organizaciones sanitarias y sociedades científicas han reconocido el problema que representa la enfermedad vascular periférica. La disponibilidad de dispositivos de menor diámetro, mayor navegabilidad y diseño específico ha facilitado la resolución de casos técnicamente desafiantes. Estas herramientas permiten al intervencionista utilizar nuevas estrategias y mejorar sus resultados. Hoy presentamos tres casos clínicos donde aplicamos lo que denominamos angioplastia retrógrada por acceso pedio con estrategia de escalamiento progresivo.

Palabras clave: enfermedad vascular periférica, acceso pedio.

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INTRODUCTION

Several health organizations and scientific societies have already recognized the problem posed by peripheral vascular disease.[1-3] The protagonism acquired by endovascular therapy comes from the benefit provided to this group of patients and the healthcare system, and from the advancements made by medical technologies.[4,5] Before, to solve infrapatellar disease, materials of coronary use were utilized. The availability of devices of smaller diameter, greater maneuverability, and specific design allowed us to solve technically challenging scenarios.[5] On the other hand, the knowledge and abilities acquired with the use of the radial technique have facilitated performing punctures in unexplored areas. Depending on the patient, the combination of femoral puncture, retrograde pedal puncture, and use of ultrasound guidance provide us with several tools to solve those cases that escaped the traditional approach. Below we present 3 case reports of what we call "technique of retrograde pedal access with a progressive escalation strategy".

PRESENTATION OF CASES

Case 1. Single pedal retrograde access

This is the case of a 73-year-old diabetic woman who is an active smoker. She showed right lower limb critical ischemia (she scored 130 in the WIFI classification) with ischemic compromise of the hallux valgus. The angiography performed revealed the presence of severe diffuse infiltrates of anterior tibial artery location without statistically significant diffuse disease of posterior tibial artery. The use of drug-eluting balloons in the anterior tibial artery is decided. The pedal artery is accessed as the single access site using ultrasound guidance. It is then decided to place a 4-Fr introducer sheath (CORDIS, Miami, United States) via radial access. Afterwards, a V14 guidewire (Boston Scientific, Massachusetts, United States) is advanced. A peripheral percutaneous transluminal angioplasty (PTA) is performed uneventfully with two 2.5 mm x 150 mm paclitaxel-eluting balloons (RANGER, Boston Scientific, Massachusetts, United States). Prolonged manual pressure hemostasis follows. The patient is discharged 6 hours later.

Case 2. Common femoral retrograde access and pedal retrograde access with angioplasty performed via pedal access

This is the case of a 68-year-old active smoker with dyslipidemia. He showed left lower limb critical ischemia (he scored 131 in the WIFI classification). The angiography revealed the occlusion of the anterior tibial artery from its origin, moderate disease of the tibiofibular trunk, and posterior tibial occlusion. PTA via antegrade access was attempted unsuccessfully. Antegrade puncture with a 7-Fr femoral introducer sheath, and ultrasound-guided retrograde puncture with a 4-Fr radial introducer sheath were performed. A V14 guidewire is advanced via retrograde access. A Rubicon 14 catheter (Boston Scientific, Massachusetts, United States) is, then, mounted on the guidewire to eventually cross the occlusion. A 2.5 mm x 150 mm peripheral balloon (COYOTE, Massachusetts, United States) is advanced and progressively predilated. Afterwards, an angioplasty with 2 3.0 mm x 150 mm and 2.5 mm x 150 mm paclitaxel-eluting balloons (RANGER, Boston Scientific Massachusetts, United States) is successfully performed. Manual pressure hemostasis is performed, and the patient is discharged the next day.

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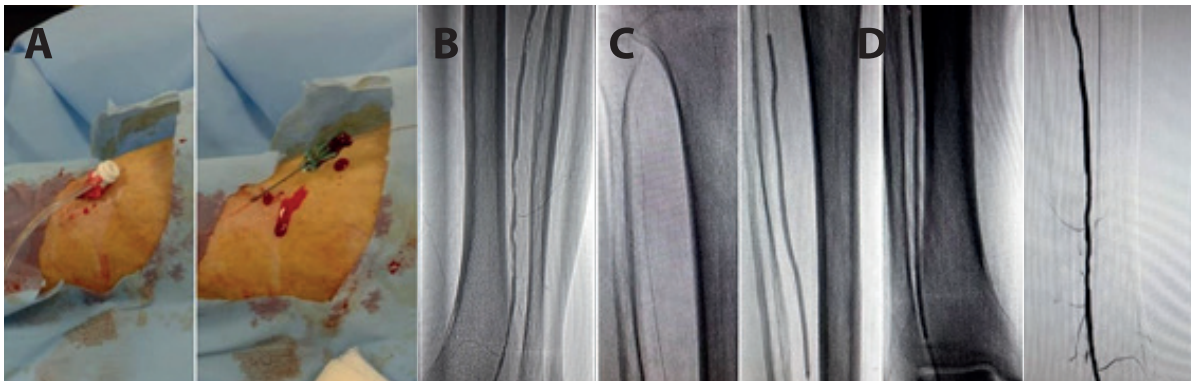

Figure 1. *Angioplasty via single retrograde access route. A:Pedal retrograde puncture with 4-Fr introducer sheath. B:Retrograde angiography of anterior tibial artery. C: Angioplasty with paclitaxel-eluting balloon. D: Final outcomes..*

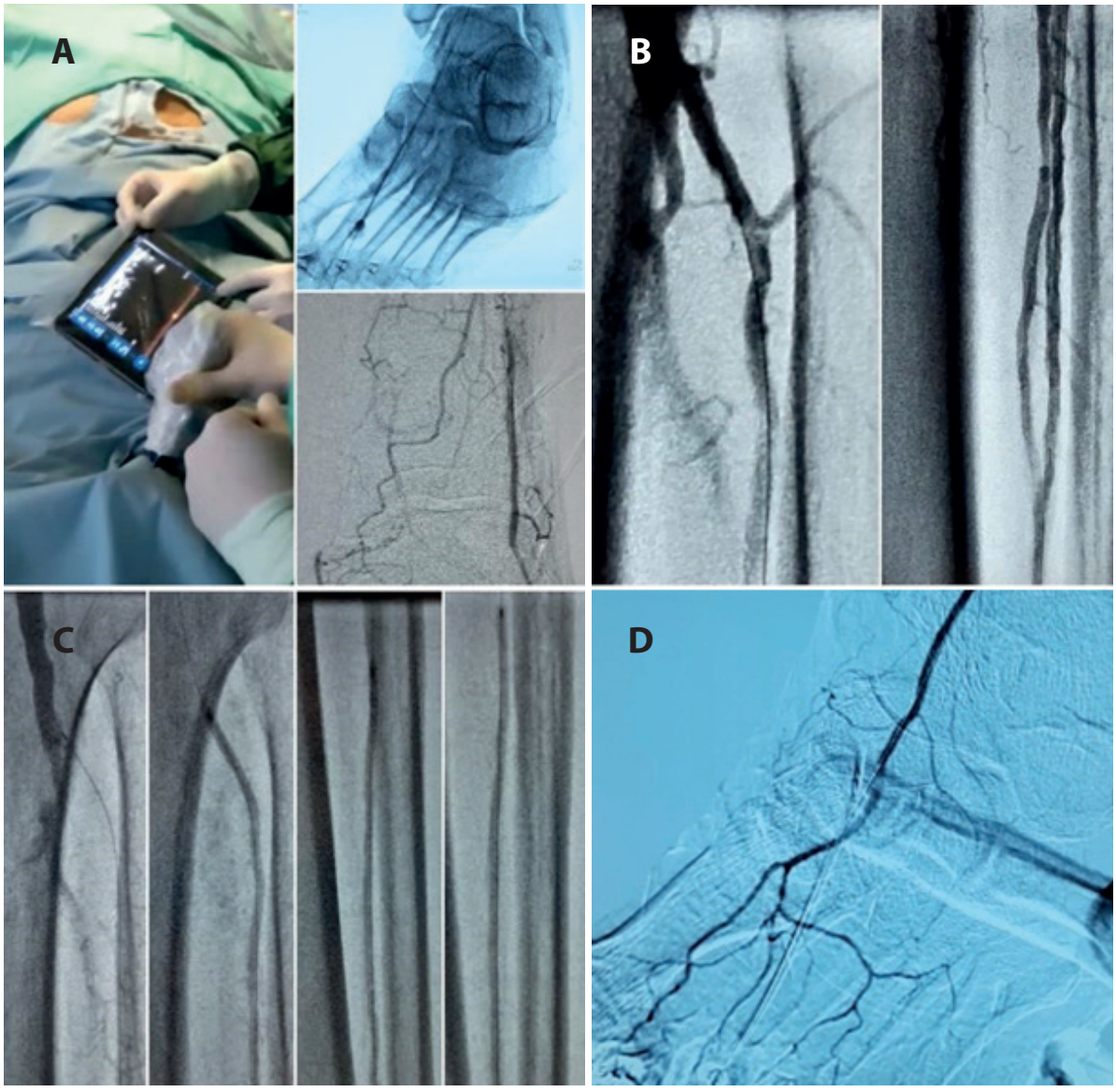

Figure 2. *Angioplasty via common femoral antegrade access and pedal retrograde access. A: Ultrasound-guided pedal retrograde puncture with a 4-Fr introducer sheath. B: Angioplasty of anterior tibial artery. C: Follow-up angiography with arterial lumen recovery. D: Foot angiography.*

Case 3. Common femoral antegrade access and pedal retrograde access with angioplasty via pedal access with double subintimal dilatation

This is the case of a 71-year-old active smoker with diabetes. He showed right lower limb critical ischemia (he scored 131 in the WIFI classification). The angiography performed revealed the presence of anterior tibial artery occlusion, diffuse posterior peroneal and tibial disease (both patent). An angioplasty on the anterior shinbone had unsuccessfully been attempted via antegrade access. Antegrade puncture with a 6-Fr

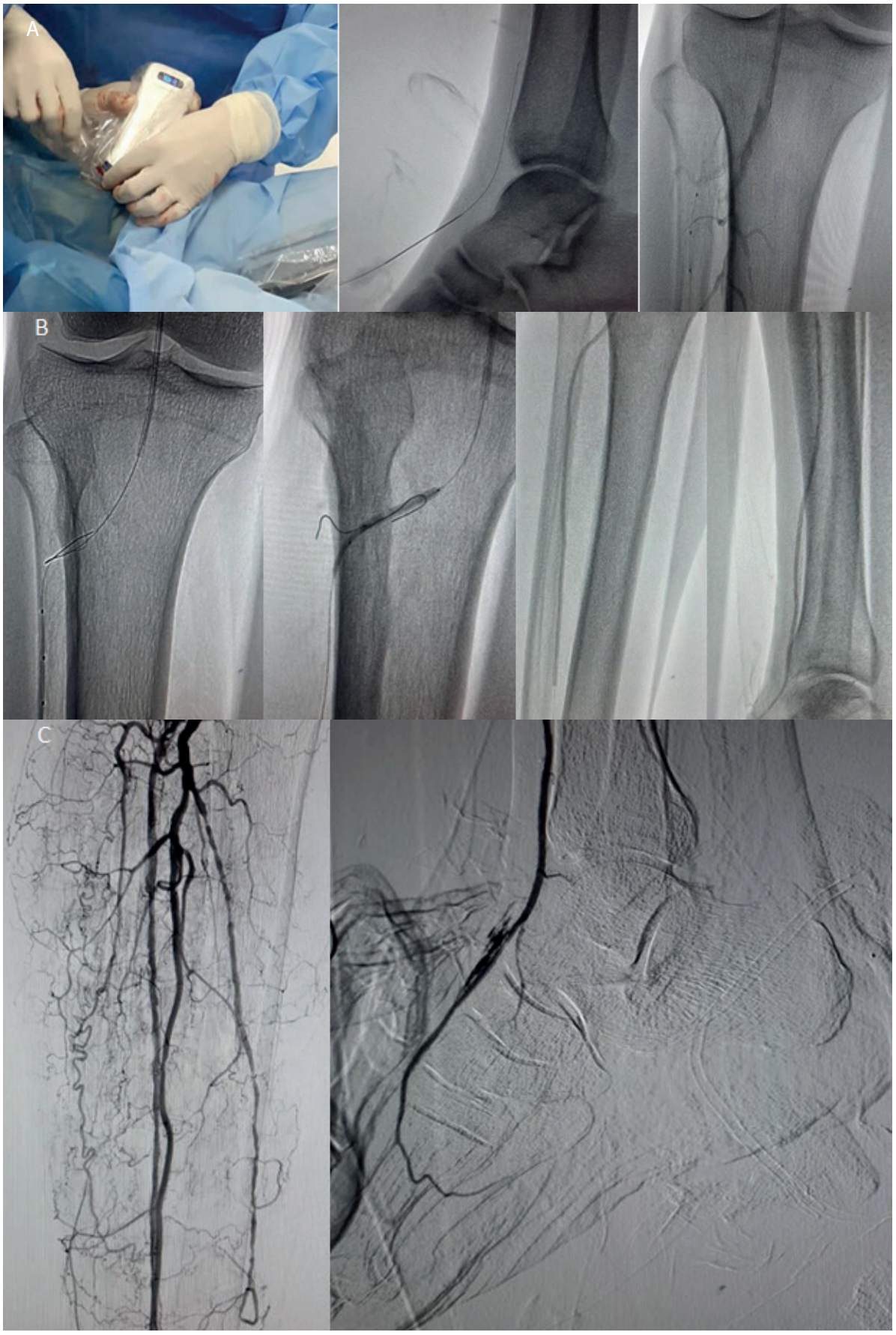

Figure 3. *A. Ultrasound-guided pedal puncture. Retrograde angioplasty is unsuccessfully attempted. B. CART technique. Presence of 2 opposing coronary balloons to gain arterial lumen from the subintimal space. Balloon angioplasty. C. Final outcomes. Foot angiography with introducer sheath removal and soft compression.*

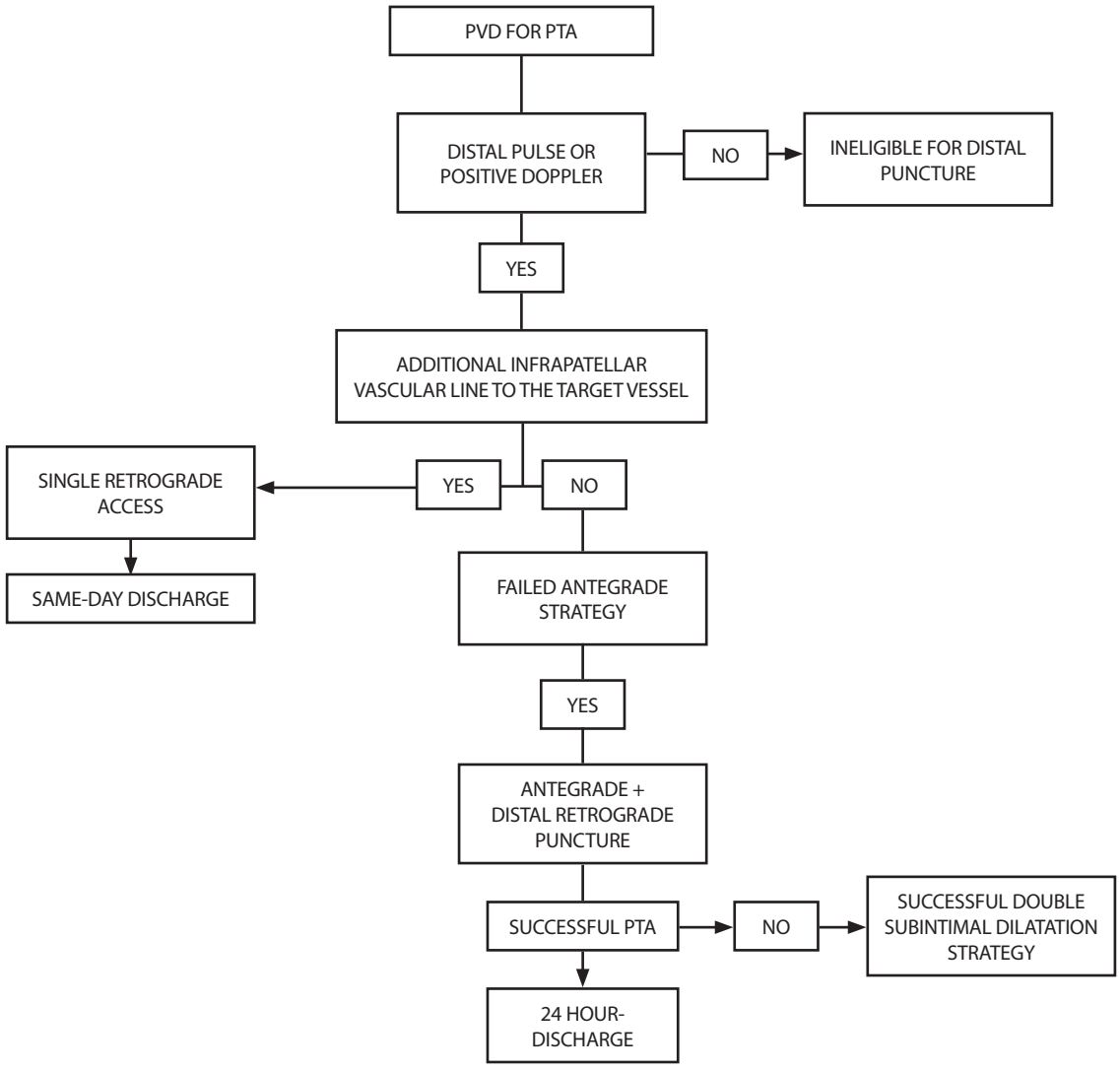

Figura 4. *Therapeutic algorithm for the peripheral angioplasty strategy via retrograde access with progressive escalation. PTA, percutaneous transluminal angioplasty; PVD, peripheral vascular disease.*

femoral introducer sheath, and ultrasound-guided retrograde puncture with a 4-Fr femoral introducer sheath via radial access are attempted. A Command 14 guidewire (Abboth, Chicago, United States) is advanced with support from a Rubicon 14 catheter (Boston Scientific, Massachusetts, United States) via retrograde access without gaining any arterial lumen yet. It is decided to escalate the strategy to double subintimal dilatation already described by Montero Baker to treat peripheral vascular disease.[6] A 5-Fr multipurpose coronary guide catheter is mounted over a second Command 14 guidewire and the entire system is advanced via anterograde access. Subintimally, advancement takes place from both accesses and 2 coronary balloons are inflated against each other (1 retrograde 1.5 mm x 15 mm balloon, and 1 antegrade, 2.0 mm x 15 mm balloon) to connect subintimal space to the lumen. Lumen from retrograde access is gained. Afterwards, a PTA is performed with one 2.5 mm x 150 mm balloon (STERLING, Boston Scientific, Massachusetts, United States). Afterwards, 2 paclitaxel-eluting balloons of the same size are successfully used (OCEANUS, IVASCULAR, Barcelona, Spain). Manual pressure hemostasis is performed, and the patient is discharged the next day.

DISCUSSION

Based on our own experience, we propose the following therapeutic algorithm for the decision-making process in patients with peripheral vascular disease. It will allow us to easily pick the most appropriate approach when having to escalate across different distal retrograde access strategies regarding the technique used and the level of aggressiveness.

The patient with peripheral vascular disease is initially examined to determine whether he could be a potential candidate for the retrograde approach.

In the presence of positive pulse or distal Doppler, and if the baseline angiography shows > 1 patent infrapatellar line, then we should probably think of using the angioplasty through a single retrograde puncture. This strategy is spared for less challenging cases.

Most patients select the antegrade strategy whether via antegrade access or through the crossover technique. If it fails, an additional retrograde puncture is performed.

At the beginning of our learning curve, the additional retrograde access was always performed in a second stage. Cu-

rrently, in those cases where the chances of success are slim (heavily calcified extensive total occlusion, for example), we start by reducing the time of the antegrade approach when the procedure exceeds its normal time, and access an infrapatellar vessel upon the patient's deman.
This type of approach does not extend the length of stay. As a matter of fact, it is reduced significantly in patients treated with single retrograde puncture.

CONCLUSIONS

The algorithm proposed above comes from the need for trying to balance 2 different problems: the first one, the need to widen the spectrum of possibilities we can offer patients who considered ineligible for traditional surgical solutions in whom the traditional approach has failed. The second one, to establish enough safety parameters to be able to face a much more aggressive strategy.
In our opinion, in patients with only 1 patent vascular line at infrapatellar level, the single vessel retrograde puncture that keeps the extremity viable is a high-risk approach that should be spared for very selected cases after adequate participation from the patient and his family in the entire decision-making process. This approach should never be used in patients with suprapatellar disease in whom femoropopliteal bypass—preferably with the great saphenous vein—can clearly improve prognosis. That's why these patients were excluded from the algorithm.
The challenge posed by peripheral vascular disease makes us have to develop new approaches to solve cases that were considered ineligible for treatment some time ago. On the other hand, as long as it remains possible, the use of smaller caliber accesses in easily compressible regions without the possibility of visceral complications, and ultrasound guidance allow us to minimize the risk for the patient, as well as the length of stay.
Retrograde PTA offers an alternative when the antegrade strategy has failed. After becoming familiar with this technique, the interventional cardiologist can use it as a first-line therapy in cases where the antegrade approach as high chances of therapeutic failure especially in patients in whom the procedure can be performed using the single pedal access.
The strategy of progressively escalating from a minimally invasive option to double puncture, and use of the double subintimal dilatation technique can capitalize our efforts based on the technical complexity of each case.

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