How we treated two right coronary ostial lesions with Szabo technique?

¿Cómo tratamos dos lesiones ostiales de arteria coronaria derecha con la técnica de Szabo?

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ABSTRACT

Aorto-ostial coronary lesions (located within the first 3 mm of the artery) are rare, and their treatment presents a challenge due to the presence of numerous technical factors that complicate precise stent implantation. The Szabo technique is one of the few interventions specifically described for this purpose. It is characterized by the use of standard materials in the practice of hemodynamics. We present our initial experience with this technique in the treatment of two patients with severe ostial obstructions in the right coronary artery, and their follow-up using multi-slice computed tomography coronary angiography.

Keywords: coronary angioplasty, ostial lesions, Szabo technique.

RESUMEN

Las lesiones coronarias aorto-ostiales (comprendidas dentro de los primeros 3 mm de su recorrido) son poco frecuentes, y su tratamiento representa un desafío por la presencia de numerosos factores técnicos que dificultan el implante preciso del stent. La técnica de Szabo es una de las pocas intervenciones descritas específicamente para tal fin, y se caracteriza por la utilización de materiales habituales en la práctica de Hemodinamia. Presentamos nuestra experiencia inicial con esta técnica para el tratamiento de dos pacientes con obstrucciones severas ostiales de arteria coronaria derecha, y su control evolutivo con coronariografía por angiotomografía coronaria computarizada multicorte.

Palabras clave: angioplastia coronaria, lesiones ostiales, técnica de Szabo.

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INTRODUCTION

Aorto-ostial coronary lesions (defined as those occurring within the first 3 mm of the artery) are rare. However, any adverse event in this location is associated with severe complications due to the extensive myocardial territory at risk. Their treatment is challenging due to numerous technical factors, such as the need to frequently disengage the guiding catheter, excessive stent movements during the respiratory cycle, or misalignment between the radiopaque balloon markers and the stent edges. These factors negatively impact the chances to achieve full circumferential coverage of the coronary ostium by the stent while preventing it from extending proximally into the aortic root or distally into the proximal segment of the native artery[1, 2].

The Szabo technique involves passing two coronary guidewires through the guiding catheter. The first guidewire (the target wire) is advanced distally into the coronary artery, while the second guidewire (the anchor wire) is left free, 2-3 cm, into the aortic root. Then, the proximal end of the first guidewire (the target wire) is passed through the distal opening of the balloon catheter mounted with the stent (delivery catheter). Then, the proximal end of the second guidewire (the anchor wire) is passed through the cell of the stent's most proximal ring. This way, the stent is advanced over both guidewires until it reaches the coronary ostium. The second guidewire (the anchor wire) stops the stent precisely at the coronary ostium, where it is then implanted. Finally, the second guidewire (anchor wire) is removed, and proximal stent post-dilation is performed with a high-pressure balloon (flaring)[3].

The aim of this study is to present the immediate technical and in-hospital outcomes of the first two patients with severe ostial obstruction in the right coronary artery treated with the Szabo technique, along with their follow-up using multi-slice computed tomography coronary angiography.

FIRST CASE

A 71-year-old woman, with a history of hypertension and smoking, presented with post-myocardial infarction angina affecting the anterior wall. Coronary angiography revealed a total occlusion (100%) of the proximal anterior descending artery and a severe (80%) ostial and proximal obstruction of the right coronary artery. The patient was premedicated with aspirin 100 mg/day and clopidogrel 75 mg/day. An angioplasty was conducted via the right radial artery on both the anterior descending artery (successful, with two drug-eluting stents) and the right coronary artery (using the Szabo technique), in a single procedure.

The ostium of the right coronary artery was located high in the right coronary sinus, with a 90° angle of exit. Operators positioned a 7-Fr JR 3.5 guiding catheter and two Pilot 50™ 0.014" coronary guidewires were advanced (**Figure 1**). Two 3.5 × 13 mm rapamycin-eluting Firehawk™ stents (MicroPort Medical, Shanghai, China) were implanted at a pressure of 20 atm (primary stenting): one in the proximal segment and the other at the origin of the right coronary artery. The ostial stent was post-dilated (flaring) with a 3.5 × 12 mm NC Euphora™ (Medtronic, Minneapolis, USA) non-compliant balloon at 20 atm. The artery showed no residual lesions, and TIMI 3 flow was achieved

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Figure 1. *Technique for "threading" the anchor guide free in the aorta to the proximal ring of the stent. A. The protective sheath of the stent is removed until the proximal ring is exposed, and controlled inflation is performed at 2 atm. B. The balloon is then deflated and the protective sheath of the stent is completely removed. C. The proximal end of the anchor guide is passed through a crown of the proximal ring of the stent.*

(**Figure 2**). The patient experienced no in-hospital complications and was discharged the following day.

SECOND CASE

A 57-year-old man, with a history of hypertension and smoking, presented with recent-onset unstable angina, classified as grade IV. A previous coronary angiography showed a severe (70%) ostial obstruction of the right coronary artery and a severe (80%) distal obstruction at the bifurcation at crux of the heart (Medina 1,1,1). The left coronary artery showed no significant angiographic obstructions. The patient was premedicated with aspirin 100 mg/day and clopidogrel 75 mg/day.

The ostium of the right coronary artery was located at the center of the right coronary sinus, with a 45° angle of exit. A 7-Fr JR 3.5 guiding catheter was positioned via the right femoral artery, and two Choice Floppy LS™ (Boston Scientific, Massachusetts, USA) 0.014" coronary guidewires were advanced into the posterior descending artery and the atrioventricular branch of the right coronary artery. Using the single kissing stent technique, two Everolimus-eluting PROMUS Elite™ (Boston Scientific, Massachusetts, USA) stents were implanted. One was 2.5 × 16 mm and it was implanted in the posterior descending artery, while the second one was 2.75 × 20 mm and it was placed in the atrioventricular branch, both at 18 atm. The guidewire from the atrioventricular branch was removed and repositioned in the aortic root (anchor wire). The ostium of the right coronary artery was then predilated with a 2.75 × 20 mm coronary balloon at 18 atm, and a 4.0 × 20 mm PROMUS Elite™ stent was implanted at its origin using the Szabo technique. Finally, the stent was post-dilated proximally ("flaring") with a 4.0 × 12 mm NC Euphora™ non-compliant balloon at 20 atm. The treated lesions had no residual lesions, and TIMI 3 flow was achieved (**Figure 3**). The patient had no in-hospital complications and was discharged the following day.

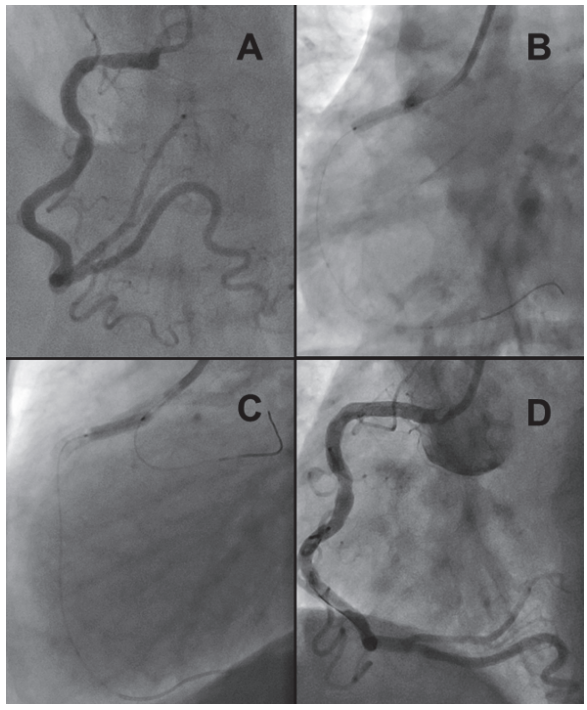

Figure 2. *Coronary angioplasty (patient 1). A. Pre-angioplasty image showing severe ostial and proximal segment obstruction of the right coronary artery (left anterior oblique [LAO] cranial view). B. Stent implantation in the proximal segment (LAO view). C. Ostial stent implantation (Szabo technique) with one coronary guidewire in the distal right coronary artery and another in the aortic root (left lateral view). D. Final result (LAO view)..*

At one month of follow-up, the patient was asymptomatic and underwent a control multi-slice computed tomography coronary angiography. The right coronary artery showed a stent at its origin and proximal segment, which was patent, with no restenosis and slightly protruding (1 to 1.5 mm) into the aortic root lumen. The distally implanted stents in the posterior descending artery and atrioventricular branch were also patent, with no signs of restenosis (**Figure 4**).

DISCUSSION

Szabo's original 2005 article includes an image of the angiographic result of a stent implanted at the ostium of the right coronary artery. Since then, various experiences with this technique in the treatment of other coronary arteries (left main coronary artery, anterior descending, and circumflex arteries) and non-coronary arteries (left internal mammary anastomosis, aortocoronary venous grafts, and renal arteries) have been published in the medical literature[4, 5].

The Szabo technique is characterized by using materials available in any cath lab: a guiding catheter, two coronary guidewires, and a drug-eluting stent[6]. To achieve satisfactory results and avoid complications, it is essential to rigorously follow each step of the procedure and carefully select

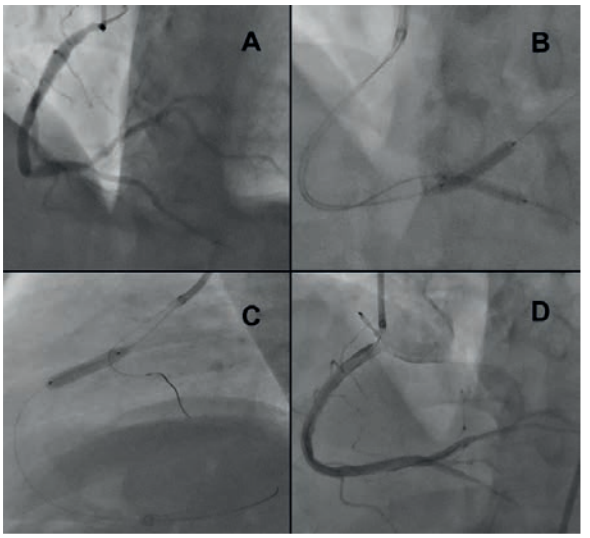

Figure 3. *Coronary angioplasty (patient 2). A. Pre-angioplasty image showing severe ostial and distal bifurcation obstruction of the right coronary artery (LAO cranial view). B. Stent implantation in the distal bifurcation using the single kissing stents technique (LAO cranial view). C. Ostial stent implantation (Szabo technique) with one guidewire in the distal right coronary artery and another in the aortic root (left lateral view). D. Final result (LAO cranial view).*

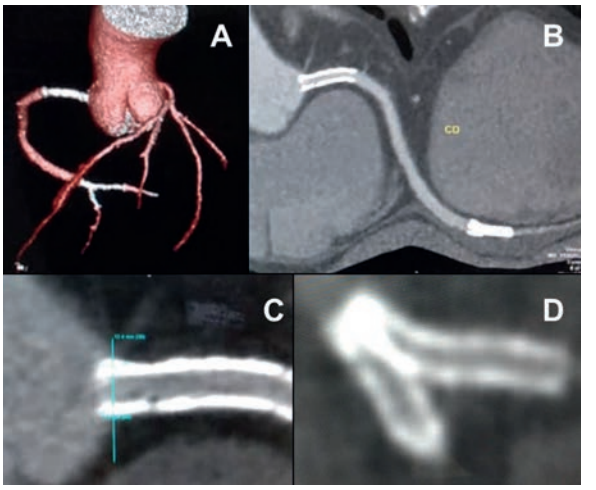

Figure 4. *. Multislice cardiac computed tomography (patient 2). A. 3D reconstruction of the coronary artery tree and the aortic root. B. Multiplanar reconstruction of the right coronary artery. C. Stent in the ostium of the right coronary artery, slightly protruding into the aorta. D. Stents in the distal bifurcation of the right coronary artery.*

the materials. Specifically: 1) Make sure that the guidewires are not crossed. 2) While primary stenting was conducted without issues in the first case, the recommendation is to always predilate the lesion before stent implantation[7]. 3) Carefully thread the proximal ring of the stent to avoid damaging the balloon. Then, properly compress the metallic guidewire between the stent and the balloon to ensure smooth and safe sliding. 4) Due to variations in the aortic location of the coronary ostium and its angle of exit, it is necessary to choose the best radiological projection for stent implantation (which, in our two cases, was the left lateral view). 5) When advancing the stent into the coronary artery, do it slowly, paying attention to the tactile sensation of restriction caused by the aortic anchor guide to avoid its detachment from the balloon[8]. 6) While we used hydrophilic coronary guidewires without complications in the first case, they are not recommended, as their coating might detach with the friction from the stent. 7) To prevent stent deformation, the scaffold should be a slotted tube type with open cells.

CONCLUSION

In our initial experience, the Szabo technique proved to be an effective and complication-free alternative for treating two patients with ostial lesions of the right coronary artery. Multislice computed tomography coronary angiography was a simple, precise, and reliable follow-up method for this type of intervention.

REFERENCES

1. *Dishmon D, Elhaddi A, Packard K, et al. High incidence of inaccurate stent placement in the treatment of coronary aorto-ostial disease. J Invasive Cardiol 2011;23:322-326.*
2. *Jaffe R, Halon D, Shiran A, et al. Percutaneous treatment of aorto-ostial coronary lesions: Current challenges and future directions. Int J Cardiol 2015;186:61-66.*
3. *Szabo S, Abramowitz B, Vaitkus PT. New technique for aorto-ostial stent placement. Am J Cardiol 2005;96:212H.*
4. *Applegate R, Davis J, Leonard J. Treatment of ostial lesions using the Szabo technique: A case series. Catheter Cardiovas Interv 2008;72:823-828.*
5. *Salazar M, Kern M, Patel P. Exact deployment of stents in ostial renal artery stenosis using the stent tail wire or Szabo technique. Catheter Cardiovasc Interv 2009;74:946-950.*
6. *Kwan T , Chen J, Cherukur S, et al. Transradial Szabo technique for intervention of ostial lesions. J Interven Cardiol 2012;00:1-5.*
7. *Jain R, Padmanabhan C, Chitnis N. Causes of failure with Szabo technique - An analysis of nine cases. Indian Heart J 2013;65:264-268.*
8. *Ferrer Gracia M, Sánchez Rubio J, Calvo Cebollero I. Stent dislodgement during Szabo technique. Int J Cardio 2011;147: 8-9.*