Ostial left anterior descending (unprotected left main) primary percutaneous coronary intervention via distal transradial access in the setting of cardiogenic shock due to anterior ST-segment elevation myocardial infarction

Intervenção coronária percutânea primária em óstio da artéria descendente anterior (tronco de coronária esquerda não protegido) via acesso transradial distal em vigência de choque cardiogênico devido a infarto do miocárdio anterior

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ABSTRACT – Despite the well-known benefits of transradial access, critically-ill patients presenting with cardiogenic shock are usually submitted to coronary angiography and percutaneous coronary intervention via classic transfemoral access, mainly due to difficult puncture of radial artery in the setting of hemodynamic instability. We report a challenging case of anterior ST-segment elevation myocardial infarction, complicated by cardiogenic shock, requiring primary percutaneous coronary intervention of ostial left anterior descending artery with two-stents technique, safely and successfully performed via right distal transradial access.

Keywords: Shock, cardiogenic; ST elevation myocardial infarction; Percutaneous coronary intervention; Radial artery/surgery

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RESUMO – Apesar dos benefícios bem conhecidos do acesso radial, os pacientes criticamente enfermos com choque cardiogênico são geralmente submetidos à coronariografia e à intervenção coronária percutânea via acesso femoral, principalmente devido à dificuldade na punção da artéria radial em quadros de instabilidade hemodinâmica. Relatamos um caso desafiador de infarto do miocárdio com supradesnívelamento do segmento ST de parede anterior, complicado por choque cardiogênico, que exigiu intervenção coronária percutânea primária em óstio da artéria descendente anterior com técnica de dois stents, realizada com segurança e sucesso pelo acesso radial distal direito.

Descritores: Choque cardiogênico; Infarto do miocárdio com supradesnível do segmento ST; Intervenção coronária percutânea; Artéria radial/cirurgia

Número do registro: RBR-7nxxkm

INTRODUCTION

Transradial access (TRA) has been shown to be cost-effective, with fewer access site-related complications, patient earlier ambulation and greater postprocedural comfort, in comparison with the classic transfemoral approach (TFA).¹ In patients with acute coronary syndromes (ACS), TRA diminishes net adverse clinical events, through a reduction in major bleeding and all-cause mortality;² thus, it is recommended (Class I,

Level A) as default approach for coronary angiography (CAG) and percutaneous coronary intervention (PCI), by recent European guidelines.³

Despite the benefits of TRA, critically ill patients presenting with ACS-related cardiogenic shock are usually submitted to CAG and PCI via TFA, mainly due to challenge puncture of radial artery (RA) in the setting of hemodynamic instability.⁴ Otherwise, PCI involving bifurcation lesions are encountered in 15% to 20% of cases in daily practice.⁵ The inherent difficulty of bifurcation PCI stems from the fact that stent implantation in main branch may lead to acute impairment of flow in side branch,⁶ and TFA is often the preferred access in this scenario.

As a refinement of the conventional proximal TRA (pTRA), distal TRA (dTRA) has many advantages in terms of faster hemostasis, operator and patient comfort (especially for left dTRA – ldTRA), and risk of RA occlusion (RAO).^{1,7}

We report a challenging case of anterior ST-segment elevation myocardial infarction, complicated by cardiogenic shock, requiring primary PCI of ostial left anterior descending artery with two-stents technique, safely and successfully performed via right dTRA.

CASE PRESENTATION

A 65-year-old female with hypertension, type 2 diabetes, obesity, dyslipidemia and previous ostial left circumflex (LCx) PCI, was referred to our cath lab due to anterior ST-segment elevation myocardial infarction (STEMI), complicated by cardiogenic shock, requiring high doses of dobutamine and norepinephrine. Emergency CAG was immediately performed via 6F right dTRA (Figure 1). Patient's

Figure 1. Right distal transradial access at the end of the procedure.

right upper arm was placed on a sideboard with the hand in a neutral position. After disinfection, the patient was covered with sterile drapes and asked to grasp her thumb under the other four fingers, in order to bring the distal RA to the surface of the anatomical snuffbox, with slight ulnar wrist flexion. After local anaesthesia with lidocaine, distal RA was immediately (first attempt) punctured, proximal to the extensor pollicis longus tendon, in the anatomical snuffbox, using a 20G micropuncture plastic cannula-over-needle as per the Seldinger's technique, under an angle of 30 to 45°, from lateral to medial, into direction of proximal course of RA, without ultrasound guidance. After successful arterial puncture, with brisk back flow, a flexible, soft, straight 0,021' hydrophilic guidewire was smoothly advanced through the cannula, and then used as a rail to sheath advancement through the RA. Our cases are routinely performed using a short 10cm 6F hydrophilic radial sheath Radifocus® Introducer II Standard Kit (Terumo Corp., Tokyo, Japan), the default device in our cath lab. The 5F diagnostic TIG® catheter (Terumo Corp., Tokyo, Japan) is used for all patients as first choice.

Beyond left main (LM) and ostial-proximal LCx (in-stent) moderate and diffuse luminal reduction, left anterior descending (LAD) was occluded (Thrombolysis in Myocardial Infarction – TIMI – flow 0) at its ostium (Figure 2), with strong Rentrop 3 collaterals from the right coronary artery (Video 1). Primary PCI was then performed via the same right dTRA, with a VL 3.5 6F guiding catheter (Boston Scientific, Massachusetts, USA). After sequential LM-LAD predilations with a 2.0/30mm semi-compliant (SC) balloon, a 3.5/38mm drug-eluting stent (DES) was carefully and optimally deployed from ostial LM up to proximal LAD, and then post-dilated with a 4.0/08mm non-compliant (NC) balloon. Proximal optimization technique (POT) of LM stent portion was performed with a 4.5/08mm NC balloon (Figure 3). Due to ostial LCx “pinching” associated to (previous) in-stent diffuse disease, LCx was rewired and predilated (through LM-LAD DES struts) with the same 2.0/30mm SC balloon, before deployment of a 3.0/18mm DES (ostial-proximal LCx – “T-stenting” technique). Step kissing balloon inflation was performed with this stent balloon (LM-LCx) and a 4.0/08mm NC balloon (LM-LAD) and final POT (LM) was repeated according to the following description (Figure 4). A NHLBI type D⁸ LCx distal stent edge dissection was promptly fixed with deployment of an additional 3.0/28mm DES (Figure 5). Successful final result with TIMI 3 flow was achieved (Figure 6). Of note, intravascular ultrasound guidance was not possible due to reimbursement constraints.

At the end of the procedure, the sheath was pulled out for a few centimeters, and a TR Band® radial compression device (Terumo Corp., Tokyo, Japan) was placed over puncture site. By following the concept of patent hemostasis (just enough pressure to prevent bleeding but not so much as to cause complete vessel collapse), TR Band® was inflated with only 2mL above the “bleeding volume” at sheath

Figure 2. Baseline angiography in different projections.

Video 1. Well-developed Rentrop 3 collaterals from right coronary artery to left anterior descending.

Figure 3. Ostial left main-proximal left anterior descending artery stent positioning, deployment and post-dilations.

Figure 4. Ostial left circumflex “T” stenting followed by step kissing balloon inflation and left main second proximal optimization technique.

Figure 5. Distal left circumflex stent edge dissection requiring additional stent implantation.

Figure 6. Angiographic result.

removal and was left in situ for 20 minutes, when deflation process started, by removing 2 to 3mL each 15 minutes. TR Band® was completely removed after 2 hours, without any further bleeding. Proximal and distal right radial pulses were easily palpable after hemostasis and at hospital discharge, 5 days later, without any minor or major access site-related or clinical complications.

DISCUSSION

Since February 2019, patients referred to our cath lab have been continuously included in the DISTRACTION registry (DIStal TRAnsrAdial access as default approach for Coronary angiography and intervenTIONS; CAAE: 30384020.5.0000.5505), the first Brazilian prospective observational registry designed to evaluate dTRA as default approach for performing routine CAG and/or PCI. Our initial experience results have been recently published.⁹ Mean patient age was 62.4-years and most were male (65.9%). About half (49.4%) of patients had ACS. Overall, 15.1% had STEMI. Distal RA was successfully punctured in all 435 consecutive patients, always without ultrasound (US) guidance. We had only 3% access site crossover (successful arterial puncture but failed wire advancement and sheath insertion), mainly performed via contralateral dTRA (53.8%). Successful dTRA sheath insertion was then achieved in 98.6% of patients. Redo ipsilateral dTRA was performed in 2.5% of patients.¹⁰ Neither major adverse cardiac and cerebrovascular nor major ischemic local events were recorded. According to EASY hematoma classification,¹¹ no significant access site-related hematoma type ≥ 2 was recorded. There was no documentation of hand/thumb dysfunction after any procedure.⁹ To date, after the first 17 months, more the 1,600 consecutive patients have been enrolled, with high success and no major complication rates supporting the feasibility and safety of this new technique.

Coomes et al.⁷ recently published a systematic scoping review of 19 publications comprising 4,212 participants undergoing CAG via dTRA. Mean patient age was 63.8 years; 23.0% were female. dTRA was primarily used for stable coronary artery disease (87.6%), with 41.7% for diagnostic procedures and 46.9% undergoing PCI. The overall success rate for dTRA approach was 95.4% (69% to 100%). Complications occurred in 2.4% of cases, the leading (18.2%) being bleeding/hematoma.⁷ However, none of these individual centres have reported their experience with dTRA as routine default approach for the procedures.

Distal transradial access represents a novel access site in interventional cardiology and current literature demonstrates high success and infrequent complications rates.^{7,9} Distal transradial access may provide important advantages over traditional TRA, including patient comfort, shorter hemostasis and lower rates of proximal RAO.^{1,7} Updated observational literature indicates dTRA is reliable and safe.⁷ Particularly for left dTRA, in comparison to classic

left TRA, since left upper arm can be positioned over patient's belly towards the operator, catheters can be more easily handled without the need to bend over patient, thus with greater patient and operator comfort.⁹

In conclusion, really challenging cases of STEMI-related cardiogenic shock requiring primary PCI of unprotected LM bifurcation lesions with two-stents techniques can be safely and successfully performed via dTRA by highly experienced transradial operators, with patient and operator comfort and significant reduction of access site-related complications.

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CONFLICTS OF INTEREST AND DATA INTEGRITY

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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None.

CONTRIBUTION OF AUTHORS

Conception and design of the study: MDPO e AC; data collection: MDPO e ECN; data interpretation: MDPO, ECN, FT e AC; text writing: MDPO e AC; approval of the final version to be published: MDPO, ECN, FT e AC.

REFERENCES

- Corcos T. Distal radial access for coronary angiography and percutaneous coronary intervention: A state-of-the-art review. *Catheter Cardiovasc Interv.* 2018;1–6. <https://doi.org/10.1002/ccd.28016>
- Valgimigli M, Gagnor A, Calabró P, Frigoli E, Leonardi S, Zaro T, Rubartelli P, Briguori C, Andò G, Repetto A, Limbruno U, Cortese B, Sganzerla P, Lupi A, Galli M, Colangelo S, Ierna S, Ausiello A, Presbitero P, Sardella G, Varbella F, Esposito G, Santarelli A, Tresoldi S, Nazzaro M, Zingarelli A, de Cesare N, Rigattieri S, Tosi P, Palmieri C, Brugaletta S, Rao SV, Heg D, Rothenbühler M, Vranckx P, Jüni P; MATRIX Investigators. Radial versus femoral access in patients with acute coronary syndromes undergoing invasive management: a randomised multicentre trial. *Lancet.* 2015;385(9986):2465–76. [https://doi.org/10.1016/S0140-6736\(15\)60292-6](https://doi.org/10.1016/S0140-6736(15)60292-6)
- Neumann FJ, Sousa-Uva M, Ahlsson A, Alfonso F, Banning AP, Benedetto U, Byrne RA, Collet JP, Falk V, Head SJ, Jüni P, Kastrati A, Koller A, Kristensen SD, Niebauer J, Richter DJ, Seferovic PM,

- Sibbing D, Stefanini GG, Windecker S, Yadav R, Zembala MO; ESC Scientific Document Group. 2018 ESC/EACTS Guidelines on myocardial revascularization. *Eur Heart J*. 2019;40(2):87–165. <https://doi.org/10.1093/eurheartj/ehy394>. Erratum in: *Eur Heart J*. 2019 Oct 1;40(37):3096
4. Thiele H, Akin I, Sandri M, Fuernau G, de Waha S, Meyer-Saraei R, Nordbeck P, Geisler T, Landmesser U, Skurk C, Fach A, Lapp H, Piek JJ, Noc M, Goslar T, Felix SB, Maier LS, Stepinska J, Oldroyd K, Serpytis P, Montalescot G, Barthelemy O, Huber K, Windecker S, Savonitto S, Torremante P, Vrints C, Schneider S, Desch S, Zeymer U; CULPRIT-SHOCK Investigators. PCI strategies in patients with acute myocardial infarction and cardiogenic shock. *N Engl J Med*. 2017;377(25):2419–32. <https://doi.org/10.1056/NEJMoA1710261>
 5. Banning AP, Lassen JF, Burzotta F, Lefèvre T, Darremont O, Hildick-Smith D, Louvard Y, Stankovic G. Percutaneous coronary intervention for obstructive bifurcation lesions: the 14th consensus document from the European Bifurcation Club. *EuroIntervention*. 2019;15(1):90–98. <https://doi.org/10.4244/EIJ-D-19-00144>
 6. Milasinovic D, Wijns W, Ntsekhe M, Hellig F, Mohamed A, Stankovic G. Step-by-step manual for planning and performing bifurcation PCI: a resource-tailored approach. *EuroIntervention*. 2018;13(15):e1804–e1811. <https://doi.org/10.4244/EIJ-D-17-00580>
 7. Coomes EA, Haghbayan H, Cheema AN. Distal transradial access for cardiac catheterization: A systematic scoping review. *Catheter Cardiovasc Interv*. 2019 Nov 29. <https://doi.org/10.1002/ccd.28623>
 8. Huber MS, Mooney JF, Madison J, Mooney MR. Use of a morphologic classification to predict clinical outcome after dissection from coronary angioplasty. *Am J Cardiol*. 1991;68(5):467–71. [https://doi.org/10.1016/0002-9149\(91\)90780-o](https://doi.org/10.1016/0002-9149(91)90780-o)
 9. Oliveira MD, Navarro EC, Kiemeneij F. Distal transradial access as default approach for coronary angiography and interventions. *Cardiovasc Diagn Ther*. 2019;9(5):513–519. doi: <https://doi.org/10.21037/cdt.2019.09.06>
 10. Oliveira MD, Navarro EC, Caixeta A. IVUS-guided DK-crush left anterior descending-diagonal complex bifurcation PCI via redo distal transradial access. *J Xiangya Med*. 2020;5:20. <https://doi.org/10.21037/jxym-20-58>
 11. Bertrand OF, De Larochellière R, Rodés-Cabau J, Proulx G, Gleeton O, Nguyen CM, Déry JP, Barbeau G, Noël B, Larose E, Poirier P, Roy L; Early Discharge After Transradial Stenting of Coronary Arteries Study Investigators. A randomized study comparing same-day home discharge and abciximab bolus only to overnight hospitalization and abciximab bolus and infusion after transradial coronary stent implantation. *Circulation*. 2006;114(24):2636–43. <https://doi.org/10.1161/CIRCULATIONAHA.106.638627>