Case Report

Chronic Total Occlusion Recanalization Concurrent to Culprit Primary Percutaneous Coronary Intervention via Distal Transradial Access: Maximizing Revascularization Through Minimalist Approach

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ABSTRACT

For ST-segment elevation myocardial infarction (STEMI) patients with multi-vessel coronary disease, complete revascularization is superior to culprit-only percutaneous coronary intervention (PCI). Chronic total occlusion represents the most challenging setting for PCI. Distal transradial access (dTRA) has advantages such as faster hemostasis and risk of proximal radial artery occlusion. We report a case of nonculprit coronary total occlusion recanalization concurrent to culprit primary PCI via dTRA in the setting of STEMI.

Key words: Chronic total occlusion, Percutaneous Coronary Intervention, distal transradial access, multi-vessel coronary artery disease, ST-segment elevation myocardial infarction

INTRODUCTION

According to the most recent evidence, among patients with ST-segment elevation myocardial infarction (STEMI) and multi-vessel coronary artery disease, complete revascularization was superior to culprit lesion-only percutaneous coronary intervention (PCI) in reducing the risk of cardiovascular death, myocardial infarction, or ischemia-driven revascularization.[1]

In 10%–15% of patients with STEMI, concurrent coronary chronic total occlusion (CTO) in a noninfarct-related artery is present and is associated with increased morbidity and mortality.[2] CTO represents the most challenging setting for PCI. Although transfemoral approach is still the most common access site in this setting, transfemoral access (TRA) has been used with similar procedural success.[3] 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 access.[4] In patients with acute coronary syndromes, TRA diminishes net adverse clinical events, through a reduction in major bleeding and all-cause mortality[5] and is thus

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recommended (Class I, Level A) as default approach for coronary angiography (CAG) and PCI by recent European guidelines.[6]

As a refinement of the conventional proximal TRA, distal transradial access (dTRA) has many advantages in terms of faster hemostasis, operator and patient comfort, and risk of proximal radial artery occlusion.[4,7]

CASE PRESENTATION

A 63-year-old man, active smoker, with neglected long-term hypertension and limiting (to any minimal efforts) stable angina through the last year, was referred to our catheterization laboratory due to lateral STEMI, with rest ongoing typical chest pain for the last 12 h [Figure 1]. Emergency CAG was immediately performed via right dTRA (rdTRA) 6Fr [Figure 2]. Beyond nondominant mid-left circumflex significant narrowing and first diagonal proximal acute occlusion (infarct-related artery), it was also noted a diffuse, calcified and severe proximal left anterior descending (LAD) atheromatosis, ending up into a CTO, with strong Rentrop 3 collaterals from the right coronary artery [Figure 3 and Video 1].

The culprit and acutely occluded diagonal branch was easily recanalized, with a long 2.5/38 mm drug-eluting stent (DES) deployment, with adequate balloon pre- and post-dilations. Due to the patient’s complaints of limiting stable angina for the past 1-year, attributable to LAD CTO, and since the culprit primary PCI was completed with very low contrast volume and radiation exposure, it was decided to perform concurrent ad hoc LAD CTO PCI. After laborious balloon-supported antegrade guidewire crossing and then multiple and sequential predilations (1.2/8 mm and 2.5/20 mm semicompliant balloons), the LAD was successfully recanalized, with a very long 3.0/48 mm DES carefully and optimally deployed and postdilated (4.0/20 mm noncompliant balloon) at its proximal-mid portion [Figure 4 and Videos 2-4].

Of note, intravascular imaging guidance (IVUS) and CTO PCI-dedicated devices such as microcatheters and specific guidewires were not possible due to reimbursement constraints.

Adequate hemostasis was easily and promptly obtained just after only 1 h with an adaptation of the Seal-one® radial compression device (PEROUSE MEDICAL, Ivry le Temple, France) for dTRA, without any bleeding [Figure 2]. Post-PCI transthoracic echocardiogram showed apical akinesia associated with lateral and anterior hypokinesia, resulting in moderate left ventricle systolic dysfunction (ejection fraction: 0.4).

Proximal and distal right radial pulses were easily palpable after hemostasis and at hospital discharge (60 h after), without any minor or major access site-related or clinical complications. Following the current evidence in favor of complete revascularization after STEMI,[1] just 1 week after the index procedure, the remaining left circumflex stenosis was also fixed through redo rdTRA staged DES PCI.

DISCUSSION

To the best of our knowledge, this is the first report of concurrent multivessel culprit primary PCI and ad hoc nonculprit CTO PCI via dTRA, followed by early staged complete revascularization through redo ipsilateral dTRA, performed by one single operator.

The COMPLETE trial showed that, among patients with STEMI and multivessel coronary artery disease, a strategy of staged nonculprit-lesion PCI with the goal of complete revascularization resulted in a 26% lower risk of a composite of cardiovascular death or new myocardial infarction at a median follow-up of 3 years than did a strategy of culprit lesion-only PCI. This benefit

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Figure 1: Electrocardiogram at presentation, showing ST-segment elevation at lateral leads (white rectangles)

Figure 2: Right distal transradial access hemostasis with the Seal-one® radial compression device
was driven by the 32% lower risk of new, nonfatal myocardial infarction in the complete revascularization group; the incidence of death from cardiovascular causes was similar in the two groups. For the second coprimary outcome, which included ischemia-driven revascularization in addition to the other two events, the risk with a complete revascularization strategy was approximately half that with a culprit lesion-only PCI strategy. There was no significant difference between the two groups in the risk of major bleeding or stroke. The benefit of complete revascularization was consistently observed regardless of whether nonculprit-lesion PCI was to be performed during the index hospitalization or several weeks after discharge from the hospital.\(^1\)

Recanalization of the CTO may restore the contractile function of the hibernating myocardium and may improve healing of the infarct border zone, especially where the perfusion area of the infarct-related coronary artery and the CTO are adjacent or overlapping, exactly as in the present case. A subgroup analysis of the EXPLORE trial showed that CTO PCI in patients with a concurrent LAD CTO was associated with a significantly higher left ventricle ejection fraction after 4 months compared with no CTO PCI, a finding suggesting that CTO PCI can improve outcomes in high-risk patients.\(^2\)

Since February 2019, patients referred to our catheterization laboratory have been continuously included in the DIStal TRAnsradial access as default approach for Coronary angiography and intervenTINs (DISTRACTION) registry (Brazilian Registry of Clinical Trials Identifier: RBR-7nzxkm), the first Brazilian prospective observational registry designed to evaluate dTRA as default approach for performing routine CAG and/or PCI. Our results have been recently published.\(^{[8-13]}\)

Mean patient age was 62.4 years old and most were male (65.9%). The majority (49.4%) of patients had acute coronary syndromes. Overall, 15.1% had STEMI. The distal radial artery was successfully punctured in all patients, always without US guidance. We had only 3% access site crossovers (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 all patients. "Redo ipsilateral dTRA was performed in 2.5% of patients.

Neither major adverse cardiac and cerebrovascular nor major ischemic local events were recorded. According to easy hematoma classification,\(^{[14]}\) no significant access site-related hematoma type ≥2 was recorded. There was no documentation of hand/thumb dysfunction after any procedure.\(^{[8-11]}\) To date, after the first 28 months, more than 3,000 consecutive patients have been enrolled, with high success and no major complication rates supporting the feasibility and safety of this new technique.

Coomes \textit{et al.}\(^{[7]}\) recently published a systematic scoping review of 19 publications comprising 4212 participants undergoing cardiac catheterization via dTRA. Mean patient age was 63.8 years old; 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%–100%). Complications occurred in 2.4% of cases, the leading (18.2%) being bleeding/hematoma.\(^{[6]}\)
However, none of these individual centers have reported their experience with dTRA as routine default approach for the procedures.

**CONCLUSION**

Even for challenging scenarios combining STEMI, multivessel coronary artery disease, and CTO, dTRA (and even redo ipsilateral dTRA), performed by experienced operators, is feasible and safe, with patient and operator comfort and significant reduction of access site-related complications.

**Footnote**

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.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that their name and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

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