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ORIGINAL ARTICLE

Distal Transradial Access for Coronary Procedures: Insights from 6,800 Consecutive All-Comers Patients from the DISTRACTION Registry

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Abstract

Background: Distal transradial access (dTRA), an improvement of the conventional proximal transradial access (pTRA), has advantages in terms of faster hemostasis and lower rates of proximal radial artery occlusion (RAO).

Objectives: We aim to describe our real-world experience with dTRA as the default approach for routine coronary angiography and percutaneous coronary interventions (PCI) in a large-scale sample of all-comers patients.

Methods: From February 2019 to April 2024, 6,800 consecutive patients undergoing coronary procedures via dTRA were enrolled in the DISTRACTION (DIStal TRAnsradial access as default approach for Coronary angiography and intervenTIONs) Registry.

Results: Mean patient age was 63.8 ± 15.7 years; 65% were male. Overall, 20.8% of patients had non-ST-elevation myocardial infarction (NSTEMI); 22.3% had ST-elevation myocardial infarction (STEMI), and 2.5% presented in cardiogenic shock. There were only 2% access site crossovers, mainly to ipsilateral pTRA. In only 119 patients dTRA sheath insertion could not be obtained. Right dTRA was the most frequent access, followed by redo ipsilateral dTRA, left dTRA, and simultaneous bilateral dTRA. PCI was performed in 59.5% of all cases, and the left anterior descending artery was the most treated vessel. No significant access site-related bleeding and no hand/thumb dysfunction after any procedure were documented. There were neither major complications nor major adverse cerebrovascular and cardiac events directly related to dTRA.

Conclusions: In this real-world large-scale registry of all-comers patients, the adoption of dTRA by proficient operators as the default for routine coronary angiography and interventions was safe and feasible.

Keywords: Coronary Angiography; Percutaneous Coronary Intervention; Registries.

Introduction

Distal transradial access (dTRA), an improvement of the conventional proximal transradial access (pTRA), has advantages in terms of expedited hemostasis and lower rates of proximal radial artery occlusion (RAO),[1,2] the most frequent complication of pTRA.[3]

Over the last 7 years, since the technical report by Kiemeneij,[4] dTRA has been continuously incorporated by many interventional cardiologists, endovascular surgeons, neuroradiologists, and interventional radiologists around the world.

Since February 2019, our group has adopted dTRA as first choice for coronary angiography (CAG) and percutaneous coronary intervention (PCI), and our results have been continuously published.[5-10]

We aim to describe our experience with dTRA for routine CAG and interventions in a real-world large sample of all-comers, consecutive and unselected patients, encompassing the whole spectrum of coronary artery disease.

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Central Illustration: Distal Transradial Access for Coronary Procedures: Insights from 6,800 Consecutive All-Comers Patients from the DISTRACTION Registry

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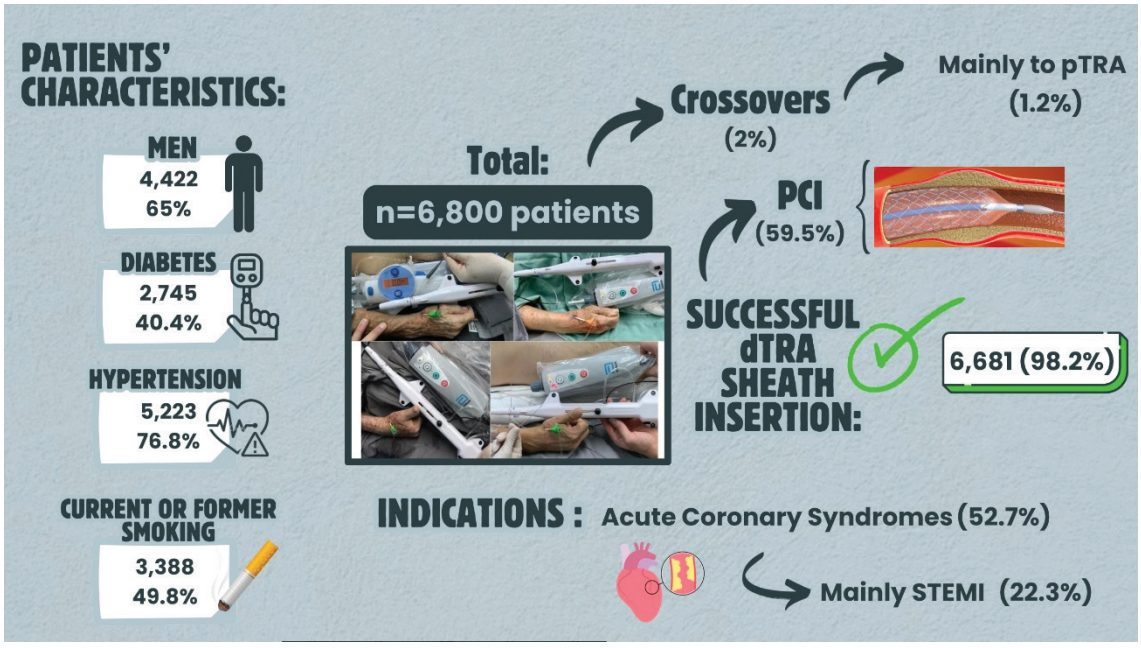

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dTRA: distal transradial access; PCI: percutaneous coronary interventions; pTRA: proximal transradial access; STEMI: ST-elevation myocardial infarction.

Methods

From February 2019 to April 2024, 6,800 consecutive patients who underwent CAG and/or PCI via dTRA at 3 tertiary hospitals (Hospital Regional do Vale do Paraíba, Taubaté, São Paulo, Brazil; Hospital MedRadius, Maceió, Alagoas, Brazil; and Hospital São Paulo, Escola Paulista de Medicina, Universidade Federal de São Paulo, São Paulo, Brazil) were continuously enrolled in the DISTRACTION (DIStal TRAnsradial access as default approach for Coronary angiography and intervenTIONs) Registry (ensaiosclinicos.gov.br Identifier: RBR-7nzxkm). The presence of any (even weak) palpable pulses at both anatomical snuffbox and wrist was the sole eligibility criterion for enrollment. Patients with unstable hemodynamic conditions were not excluded. The study was approved by the Research Ethics Committee of the Hospital São Paulo, Escola Paulista de Medicina, Universidade Federal de São Paulo (protocol 4.071.731, CAAE 30384020.5.0000.5505), and informed consent was provided as a prerequisite before enrolling each subject in this prospective registry.

Statistical analysis

Continuous variables were described as mean ± standard deviation and categorical data as numbers and percentages. A descriptive analysis of the data was carried out. All analyses were performed with Research Electronic Data Capture (REDCap), version 14.3.8, (© 2024, Vanderbilt University).

Results

Table 1 summarizes patients' baseline demographic characteristics, and Table 2 shows procedural details of all 6,800 consecutive all-comers patients enrolled.

Mean patient age was 63.8 ± 15.7 years. The majority were male, with hypertension and acute coronary syndromes. Overall, 1,518 (22.3%) patients had ST-elevation myocardial infarction (STEMI); 169 presented to the catheterization laboratory in cardiogenic shock and were submitted to CAG and/or PCI via dTRA. One hundred and twenty-three patients were already under dialysis, and 375 were prone to dialysis due to significant chronic kidney impairment (Table 1).

Table 1 – Baseline demographic characteristics of all 6,800 patients

Patient characteristics (total n = 6,800 patients)	N (%)
Age	63.8 ± 15.7
BMI (kg/m²)	27.5 ± 4.71
Men	4,422 (65.0%)
Hypertension	5,223 (76.8%)
Diabetes mellitus	2,745 (40.4%)
Current or former smoking	3,388 (49.8%)
Obesity	1,659 (25.1%)
Previous percutaneous coronary intervention	1,775 (26.1%)
Previous coronary artery bypass grafting	240 (3.5%)
Previous ipsilateral pTRA sheath insertion	694 (10.2%)
Previous ipsilateral dTRA sheath insertion	949 (14.0%)
Chronic kidney disease without dialysis (≥ 15 eGFR < 60)	375 (5.5%)
Chronic kidney disease under dialysis	123 (1.8%)
Baseline eGFR (CKD EPI)	75.21 ± 26.4
Indication for coronary angiography and/or intervention	
Chronic coronary syndromes	2,452 (36.1%)
Acute coronary syndromes	3,586 (52.7%)
Unstable angina	652 (9.6%)
NSTEMI	1,416 (20.8%)
Anterior STEMI	744 (10.9%)
Inferior STEMI	599 (8.8%)
Infero-lateral STEMI	127 (1.9%)
Lateral STEMI	48 (0.7%)
Other reasons	762 (11.2%)
Cardiogenic shock at catheterization laboratory presentation	169 (2.5%)

Data presented as mean ± standard deviation or number (percentage). BMI: body mass index; CKD EPI: Chronic Kidney Disease Epidemiology Collaboration equation; dTRA: distal transradial access; eGFR: estimated glomerular filtration rate; kg: kilogram; m: meter; NSTEMI: non-ST-elevation myocardial infarction; pTRA: proximal transradial access; STEMI: ST-elevation myocardial infarction.

For 59.5% of all 6,800 patients, PCI was undertaken. The left anterior descending artery and its branches were the most prevalent target coronary territory, followed by the right coronary artery and its branches and the left circumflex and its branches (Table 2).

The rate of access site crossovers was only 2%, mainly (1.2%) to pTRA. Successful dTRA sheath insertion was then achieved in 6,681 (98.2%) of all 6,800 patients. Right dTRA was the most frequent primary access site, followed by redo right dTRA, left dTRA simultaneous bilateral dTRA, and redo left dTRA. Standard 6-Fr radial sheaths and regular radial compression devices were used for most patients (Table 2). No differences in the occurrence of bleeding or any access site-related complications were observed among the multiple hemostasis strategies.

There were neither major complications nor major adverse cerebrovascular and cardiac events directly related to dTRA. No access site-related hematoma type ≥ 2, according to modified EASY classification[11] and no hand/thumb dysfunction were documented after any procedure. One patient developed a pseudoaneurysm after successful 6-Fr right dTRA CAG and *ad hoc* PCI, which was successfully managed by ultrasound-guided prolonged TR band® neck compression.[12]

Discussion

The present study evaluated our real-world large-scale experience with dTRA for routine coronary procedures in a broad and unselected sample of all-comers patients, encompassing all presentations of coronary artery disease. Data were obtained from the DISTRACTION Registry, the first Brazilian registry to assess dTRA as the standard for routine CAG and/or PCI.

In our very early experience, with 435 patients, the rate of access site crossovers was only 3%, mostly executed via contralateral dTRA (53.8%).[4] A subsequent analysis with 3,683 patients (8.5-fold the initial number) confirmed the maintenance of a low rate (2.5%) of access site crossover.[9] In this updated assessment, with 6,800 consecutive patients (15.5-fold the initial number), our crossover rate has further decreased to only 2%. No specific features or factors were evaluated for dTRA failure.

Contrary to most data published so far,[1,2] which essentially included patients at stable conditions, we have been including patients with any (even weak) distal radial artery palpable pulses, regardless of the clinical scenario at presentation. Of note, the majority (52.7%)

Table 2 – Procedural characteristics

Procedural characteristics (total n = 6,800 patients)	N (%)
Isolated elective coronary angiography	1,622 (23.9%)
Isolated urgency/emergency coronary angiography	1,120 (16.5%)
Coronary angiography + *ad hoc* percutaneous coronary intervention	2,551 (37.5%)
Coronary angiography + primary percutaneous coronary intervention	1,347 (19.8%)
Coronary angiography + rescue percutaneous coronary intervention	77 (1.1%)
Isolated percutaneous coronary intervention	44 (0.7%)
Chronic total occlusion percutaneous coronary intervention	430 (6.3%)
Target coronary artery territory	
Left main	154 (2.3%)
Left anterior descending artery and/or diagonal branches	1,949 (28.7%)
Right coronary artery and/or branches	1,313 (19.3%)
Left circumflex artery and/or obtuse marginal branches	892 (13.1%)
Other native coronary arteries/surgical grafts	80 (1.2%)
Type of dTRA	
rdTRA	5,413 (79.6%)
redo rdTRA	907 (13.3%)
ldTRA	411 (6%)
redo ldTRA	22 (0.3%)
Simultaneous bilateral dTRA (ldTRA and rdTRA)	47 (0.7%)
Sheath size	
6 Fr	6,541 (96.2%)
5 Fr, Glidesheath slender 5/6 Fr, Glidesheath slender 6/7 Fr or 7 Fr	254 (3.7%)
Hemostasis of dTRA with radial compression device	**6,577 (96.7%)**
Crossover to another access site	**134 (2%)**
ldTRA or rdTRA failure → contralateral dTRA successful	15 (0.2%)
dTRA failure → pTRA successful	83 (1.2%)
dTRA failure → TFA successful	27 (0.4%)
dTRA failure → transulnar	9 (0.1%)
Successful dTRA sheath insertion	**6,772 (99.6%)**

Data presented as mean ± standard deviation or number (percentage). dTRA: distal transradial access; Fr: French; ldTRA: left distal transradial access; pTRA: proximal transradial access; rdTRA: right distal transradial access; TFA: transfemoral access.

of our patients had acute coronary syndromes; 22.3% had STEMI, and 2.5% presented to the catheterization laboratory with cardiogenic shock. It is important to highlight that, after dTRA sheath insertion, CAG and/or PCI can be performed exactly as for pTRA.

Almost 2% of our patients were already under dialysis, and 5.5% were prone to dialysis due to significant chronic kidney impairment. In these patients, pTRA has traditionally been averted in order to preserve the radial artery for future arteriovenous fistulae confection.

Although dTRA is a variation of pTRA, it has a distinct learning curve, mainly because the final segment of the radial artery moves in different directions along the carpal bones. Different types of analyses have been performed in an attempt to study the impact of the learning curve among operators. Achim et al. evaluated the performance index over a 3-year period, namely (1) sheath time (composed of ultrasound time, puncture to sheath insertion time, number of attempts, and penetration technique, whether anterior wall or transfixing puncture), (2) guiding cannulation time, and (3) total procedure time among a single operator who pioneered this technique in their center. Throughout the years, there was no significant difference in procedure and catheter cannulation times, but the sheath parameters all improved, with a significant improvement in ultrasonography scanning and artery access time.[13]

In the only study comparing ultrasound-guided versus tactile-guided dTRA, ultrasound guidance shifted success from 87% to 97%. The study demonstrated that ultrasound-guided dTRA can improve the rate of successful puncture, even though there were no significant differences in procedural outcomes and complication rates.[14]

The most recent systematic review and meta-analysis comparing dTRA and pTRA for CAG and/or

PCI included a total of 9,151 patients (dTRA: 4,474 and pTRA: 4,677) from 28 studies. Compared to pTRA, dTRA was associated with shorter hemostasis time (mean difference [MD]: −32.49; 95% confidence interval [CI]: −65.53, −2.46; p < 0.00001) and reduced incidences of RAO (risk ratio [RR]: 0.38; 95% CI: 0.25, 0.57; p < 0.00001), any bleeding (RR: 0.44; 95% CI: 0.22, 0.86; p = 0.02), and pseudoaneurysm (RR: 0.41; 95% CI: 0.18, 0.99; p = 0.05). In turn, the drawbacks of dTRA were increased access time (MD: 0.31; 95% CI: −0.09, 0.71; p < 0.00001), and higher crossover rates (RR: 2.75; 95% CI: 1.70, 4.44; p < 0.00001).[2]

DISCO RADIAL (Distal versus Conventional Radial Access) was an international, multicenter, randomized controlled trial in which patients with indications for PCI using a 6-Fr glidesheath slender were randomized to dTRA or pTRA with systematic implementation of best practices to reduce RAO. The primary endpoint was the incidence of forearm RAO assessed by vascular ultrasound at discharge. Secondary endpoints included crossover, hemostasis time, and access site–related complications. Overall, 657 patients underwent pTRA, and 650 patients underwent dTRA. Forearm RAO did not differ between groups (0.91% versus 0.31%; p = 0.29). Patent hemostasis was achieved in 94.4% of pTRA patients. Crossover rates were higher with dTRA (3.5% versus 7.4%; p = 0.002), and median hemostasis time was shorter (180 versus 153 minutes; p < 0.001). Radial artery spasm occurred more with dTRA (2.7% versus 5.4%; p = 0.015). Overall bleeding events and vascular complications did not differ between groups.[15]

The recently published KODRA (Korean Prospective Registry for Evaluating the Safety and Efficacy of Distal Radial Approach) trial,[16] a prospective multicenter registry conducted at 14 hospitals, evaluated 4,977 patients. The rates of distal and proximal RAO by palpation at 1-month follow-up were 0.8% and 0.8% (33 of 4,340). Weak pulse (odds ratio [OR]: 9.994; 95% CI: 7.252 to 13.774) and dTRA experience < 100 cases (OR: 2.187; 95% CI: 1.383 to 3.456) were identified as predictors of puncture failure by multilevel logistic regression analysis. Access-site crossover occurred in 333 (6.7%) patients, higher than our current rate (2%).

Study limitations

This is a three-center observational registry, in which procedures were performed by two experienced interventional cardiologists. Thus, our results may not be extrapolated and generalized to other centers and to interventional cardiologists who are unfamiliar with the technique. The absence of a control group limits our suppositions. We did not systematically record dTRA puncture and cannulation attempts or fluoroscopy and procedure times. Despite the presence of proximal and distal radial artery pulses after hemostasis and at discharge, the absence of routine post-procedure Doppler ultrasound evaluation might have underestimated the vascular complication rates. On the other hand, performing a successful dTRA approach without ultrasound guidance might help to disseminate this novel technique.

Conclusions

In this real-world large-scale registry of all-comers patients, the adoption of dTRA by proficient operators as the default for routine CAG and interventions was safe and feasible.

Author Contributions

Conception and design of the research, acquisition of data, analysis and interpretation of the data, statistical analysis, obtaining financing, writing of the manuscript and critical revision of the manuscript for intellectual content: Oliveira MD, Motta RFOS, Caixeta A.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any thesis or dissertation work.

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of the Hospital Universitário I da Universidade Federal de São Paulo under the protocol number 30384020.5.0000.5505. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013. Informed consent was obtained from all participants included in the study.

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