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Distal radial approach versus conventional radial approach: a comparative study of feasibility and safety

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ABSTRACT

The distal radial approach (DRA) is suggested to have benefits over the conventional radial approach (CRA) in terms of local complications and comfort of both patient and operator. Therefore, we aimed to compare the feasibility and safety of DRA and CRA in a real life population. We conducted a prospective, observational multicentric trial, including all patients undergoing coronary procedures in September 2019. Patients with impalpable proximal or distal radial pulse were excluded. Thus, the choice of the approach is left to the operator discretion. The primary endpoints were cannulation failure and procedure failure. The secondary endpoints were time of puncture, local complications and radial occlusion assessed by Doppler performed one day after the procedure. We enrolled 177 patients divided into two groups: CRA (n = 95) and DRA (n = 82). Percutaneous intervention was achieved in 37% in CRA group and 34% in DRA group (p = 0.7). Cannulation time was not significantly different between the two sets (p = 0.16). Cannulation failure was significantly higher in DRA group (4.8% vs 2%, p < 0.0008). Successful catheterization was achieved in 98% for the CRA group and in 88% for the DRA group (p = 0.008). Radial artery occlusion, detected by ultrasonography, was found in 3 patients in the CRA group (3.1%) and nobody in the DRA group (p = 0.25). The median diameter of the radial artery diameter was higher in the DRA than the CRA group (2.2 mm vs 2.1 mm; p = 0.007). The distal radial approach is feasible and safe for coronary angiography and interventions, but needs a learning curve.

1. Introduction

Coronary artery disease is the leading cause of death in the world according to the world health organization [1]. However, the progress of percutaneous coronary intervention (PCI) techniques and devices, in the diagnosis and treatment of this disease, has significantly reduced the mortality rate. Among those methods, the procedural access has shown substantial improvements.

The first interventional procedures were done by a transfemoral approach. In 1989, Campeau had performed the first procedure by a trans-radial artery approach [2]. Then, the RIVAL study [3] demonstrated the safety and the high success rate of this approach, becoming the preferred referral access for catheterization according to the guidelines of the European Society of Cardiology. Different studies showed that the trans-radial access allows a better comfort for the patient by decreasing the vascular complications (hematoma, false aneurism) and by shortening the duration of hospitalization. And the most important benefit is the reduction of the cardiovascular mortality

in patients hospitalized with ST-segment Elevation Myocardial Infarction (STEMI).

Safety of this technique first induced some exhilaration among interventional cardiologists, but we discover later some flaws of this approach like arterial spasm and occlusion of the radial artery. Recently, the distal radial access (DRA) was described by Babunashvili and Dundua [4] in order to open occluded ipsilateral radial arteries in a retrograde fashion. Then, it was developed by Kiemeneij [5] in 2017 for coronary catheterization. Some benefits of this approach over the standard radial access were suggested like the lower risk of local complications, mainly the lower incidence of arterial radial occlusion and the better comfort of both patient and operator. Certainly, the success of this approach depends on anthropometric features of the population and the experience of the operators and needs to be assessed in real life and different conditions. That is why we conducted this first documented multicentric Tunisian experience of the distal radial

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artery access for coronary angiography and intervention. The main aim was to compare distal radial artery and conventional radial artery in terms of their efficacy, safety and usefulness.

2. Patients and methods

We conducted an observational longitudinal bicentric study, comparing distal and conventional radial approaches in patients undergoing catheterization in September 2019. Two cardiology centres participated in this study. Both centres have an annual PCI number > than 500 per year and an annual coronary angiography number > than 1500 per year. The procedures were performed by five operators with a large experience in conventional radial approach (more than 5 years) and after an initial 3 months period of training on distal radial approach. Everyone had conducted more than 100 hundred procedures by a distal radial approach, before the beginning of the study.

We included all patients with palpable proximal and distal radial pulse. The choice of the approach is left to the discretion of the operator.

We excluded patients with unpalpable distal or conventional radial pulses or those in whom we opted for the femoral approach from the beginning either like patients with a history of coronary artery bypass graft (CABG) and compulsory of femoral approach to control the grafts, or those with a history of radial access failure from both sides. We excluded also all patients punctuated by fellows.

The cardiovascular risk factors (smoking, hypertension, diabetes, dyslipidemia, and chronic kidney disease) were assessed according to the standard definitions. The history of coronary artery disease (CAD) and peripheral arterial occlusive disease were also recorded. The puncture history of the radial as well as the size of the sheaths were underlined.

Ultrasound guidance was not used in any patient in this study. Allen's test was not performed in any patient before catheterization, since it is not used in routine.

Before the arterial puncture, a local anaesthesia was administered using 2–3 mL of 2% lidocaine.

For the distal radial puncture, we first brought the artery to the surface of the fossa, the patient was asked to grip slightly his thumb under the other fingers, with a slightly abducted hand. We chose the sheath size according to the kind of planned intervention. The distal radial artery was punctured with a 21 G needle, under an angle of 45 degrees. The needle was directed to the point of the strongest pulse, proximal in the anatomical snuffbox.

The puncture of the conventional radial artery was performed according to the technique described by Campeau [2].

We administered, through the side arm of the sheath, a mix of heparin and isosorbide dinitrate to prevent vasospasm and thrombosis. Catheter advancement was typically performed with a standard 0.035″ J-tipped wire. Hemostasis was achieved with a radial band (rolled gauze pack), removed the next day.

Cannulation time was recorded from the starting of the first attempt to puncture the artery to the moment of sheath withdrawal.

Successful cannulation was confirmed by arterial blood back flow from the radial sheath side arm. Successful procedure was defined when proceeding the procedure by the first approach. In case of initial failure of the radial artery cannulation, the new access site was left to the physician discretion.

Colour Doppler ultrasound studies were performed in all patients within one day after the procedure to examine the radial artery of the access forearm with a Vivid 9 ultrasonography system featuring a vascular probe. The transducer was placed parallel to the long axis of the radial artery. The diameter of the conventional access point of the radial artery at the wrist of the patients was measured. We used Color Doppler imaging to distinguish the radial artery and the doppler angle was kept below 40° during the examination to record the proximal radial velocities. In peripheral arteries with high resistance such as radial artery, the arterial flow pattern is bi- or tri-phasic under optimal conditions of room temperature and rest. It shows a first anterograde deflection resulting from ventricular systole, followed by a reverse flow of short duration or retrograde deflection in the early diastole, and finally a small flow peak or second anterograde deflection in the late diastole resulting from the decreased wall elasticity of the peripheral arteries. This third wave may be absent in subjects without localized lesion, but whose arteries are less compliant (elderly people). The normal peak systolic velocity of the radial artery ranges between 40 and 80 cm/sec.

The doppler examination of a stenosed distal artery will show changes of the velocity profile: a delayed peak, a decrease of velocities, and a loss of the early diastolic flow inversion. We concluded at a radial artery occlusion in case of absence of radial artery pulse with a visible obstruction on two-dimensional mode or absence of a positive Doppler signal, alone or in combination.

The primary endpoint in our study was the failure target artery cannulation and the failure of performing the procedure by the first approach chosen by the operator. The secondary endpoints were time to cannulation, the occurrence of major (lodge syndrome, infection, need for vascular surgery, hand dysfunction, nerve palsy, AV fistula, hematoma needing transfusion or vascular surgery) and minor local complications (radial spasm, localized hematoma, ecchymosis, paresthesia, local edema) and the occlusion of the radial artery assessed by Doppler ultrasounds.

2.1. Statistical analyses

Statistical analyses were performed using SPSS. 21.0. Descriptive data were expressed in mean ± standard deviation, median (semi-interquartile ranges), frequency distribution, and percentage. The Pearson's chi-square test was used to analyze categorical variables. The variables were tested for conformity to normal distribution using visual (histogram and probability graphs) and analytic methods (Kolmogorov–Smirnov Test). For normally distributed variables, the Student's t-test was used to compare two independent groups, while Paired Sample t-test was used to compare two dependent groups. The relationship between the variables was analyzed using the Pearson's correlation coefficients. A p-value inferior to 0.05 was considered statistically significant.

3. Results

3.1. Study population

We enrolled in our study 177 patients divided into two groups: group of the conventional radial approach (CRA: n = 95) and the group of distal radial approach (DRA: n = 82)

The baseline clinical characteristics of our population are summarized in Table 1. The mean age was the same in both groups (59.23 ± 11.53 years in DRA group versus 60.38 ± 11.93 years in CRA group, p = 0.47). The majority of patients were males. There were no significant differences regarding the incidence of cardiovascular risk factors, between the two study groups. Two patients on hemodialysis were approached by DRA with success. There were no differences between the two groups according to the history of previous vascular approach.

Clinical presentation and coronary catheterization data are represented in Table 2. Almost half of the patients in both group had acute coronary syndrome. Five patients (6%) in the DRA group versus eight (8.4%) in the CRA group had STEMI. There was no differences between both groups according to the emergency procedures rate and primary angioplasty rate. No patients presented with cardiogenic shock.

Table 1. Demographic characteristics of our population.

	Conventional Radial Approach N = 95	Distal Radial Approach N = 82	RR, 95% CI	p
Age (years) (mean, SD)	60.38 ± 11.93	59.23 ± 11.53		0.47
Age ≥ 70 y o	19 (20%)	19 (23%)	0.9[0.62–1.3]	0.6
Male gender (n,%)	70 (73%)	62(75%)	1.05[0.72–1.53]	0.76
Smoking (n,%)	40 (42%)	34 (41.5%)	0.98[0.71–1.31]	0.9
Diabetes (n,%)	38 (40%)	37 (45%)	1.18[0.81–1.5]	0.5
Hypertension (n,%)	42 (44%)	33 (40%)	0.9[0.66–1.26]	0.6
Chronic kidney failure (n,%)	1 (1%)	3 (3.7%)	1.6[0.9–2.94]	0.26
Obesity (n, %)	4 (16.7%)	1(3.4%)	0.34[0.05–2.01]	0.12
Hemodialysis (n,%)	0 (0%)	2 (2.4%)	2.1[1.8–2.5]	0.21
Peripheral Artery Disease (n,%)	3 (3.1%)	0 (0%)	1.8[1.6–2.1]	0.24
Previous coronary catheterization by radial artery (n,%)	9 (9.5%)	12 (14.6%)		0.3
Delay since previous catheterization (months) (median, ISIQ)	6 (1.87)	5 (24.1)		0.87

Table 2. Coronary catheterization data.

	Conventional Radial Approach	Distal Radial Approach	RR, CI95%	p
Coronary angiography (n,%)	59 (63)	54 (66)		0.7
urgent	15	14		0.95
no-urgent	44	40		0.7
Coronary intervention (n,%)	36 (37)	28 (34)		0.66
primary	8	5		0.62
AD HOC	24	17		0.31
No-urgent	4	6		
Reason for catheterization (n,%)	45 (47)	37 (45)		0.76
Stable coronary disease	46 (48.4)	37 (45)		0.66
Acute Coronary Syndrom	8 (8.4)	5 (6.1)		0.55
STEMI	17 (17.8)	21 (25.6)		0.21
NSTEMI troponin+	21 (22.1)	11 (13.4)		0.13
NSTEMI troponin-	3 (3.1)	4 (4.8)		0.7
Preoperative assessment	1	3 (10.7)		0.33
LV dysfunction assessment Arrythmia	0	1 (3.6)		0.46
Coronary intervention (n,%)	36	28		0.43
Left Main	0	1 (3.6)		0.24
Left Anterior Descending	22 (61.1)	13 (46.4)		1
Circumflex	4 (11.1)	3 (10.7)		0.33
Right Coronary	10 (27.8)	11 (39.3)		

3.2. Procedural data

The procedural data are presented in Table 3.

3.3. Radial cannulation

The most used first intention arterial access was the right radial artery for both groups. One patient (1%) from the CRA group and 31 patients (38%) from the DRA group were approached by the left hand (p < 0.001).

Cannulation time was not significantly different between DRA and CRA groups (respectively 42 ± 9 seconds versus 45 ± 6.1 seconds, p = 0.16).

Failed radial cannulation was occurred in two patients (2%) in the CRA group and in four patients (4.8%) in the DRA group without significant difference (p = 0.15). In two patients from the DRA group, the puncture was successful, but the wire could not be advanced towards the forearm part of the radial artery; while in the others, the puncture failed. Radial artery spasm was noted in 8 patients from the CRA group (8.4%) and 5 patients (6%) in the DRA group (p = 0.54). This spasm did not lead to switching the first approach in all cases.

3.4. Coronary procedure

Successful catheterization was achieved in 93 out of 95 patients (98%) in the CRA group and in 72 of 82 patients (88%) in the DRA group (p = 0.008).

Four patients were crossed over through the DRA to the ipsilateral CRA, three to the contralateral conventional radial and three others to the femoral artery, followed by successful coronary cannulation. In the CRA group, one patient was crossed over through the contralateral CRA and one to the contralateral ulnar artery, also with successful outcomes. Reasons for cross-over through distal radial artery to femoral artery were the lack of catheter support to percutaneous transluminal coronary angioplasty of circumflex coronary artery and brachial artery stenosis. The other reasons of crossover were radial cannulation failure and radial artery spasm.

3.5. Coronary intervention

Angiographic data are shown in Table 2. Percutaneous intervention was done in 37% and 34% of cases via conventional and snuff box approaches, respectively (p = 0.7). One case of angioplasty of the left main artery was performed by a distal radial access. The percentage of primary percutaneous intervention (PCI) didn't differ between the two groups (p = 0.66).

3.6. Local complications

No major vascular or nerve complications were noted in the two groups. Benign local complications was summarized in Table 2, there were no significant differences between the two population (p = 0.72). Two cases of local numbness at the course of superficial branch of radial nerve were reported in the DRA group.

3.7. Radial artery occlusion

At hospital discharge, asymptomatic radial artery occlusion was found in three patients (3.1%) in the

Table 3. Procedural data.

	Conventional Radial Approach N = 95	Distal Radial Approach N = 82	OR, CI 95%	p
Right approach (n,%)	94 (99%)	51 (62%)		<0.001
6 F Sheath (n,%)	77 (81%)	53 (64%)		0.014
Procedure failure (n,%)	2 (2.1%)	10 (12.1%)		0.008
-Cannulation failure	2 (2.1%)	4 (4.8%)		0.15
Puncture failed	2	2		
Wire could not advance	0	2		
-Proximal artery stenosis	0	2		
-Lack of support	0	1		
-Artery spasm during procedure	0	3		
Switch to another access	0	4		-
- Ipsilateral Conventional radial	1	3		
- Controlateral Conventional radial	1	0		
- controlateral Ulnar	0	3		
-Femoral				
Radial artery spasm (n,%)	8 (8.5%)	5 (6%)		0.54
Cannulation time(sec) (median,ISIQ)	45 (6.1)	42 (9.0)		0.16
Radial artery diameter(mm) (median, ISIQ)	2.1 (1.2)	2.2 (0.35)		0.007
Local complications (n,%)	5 (5.3%)	3 (3.7%)		0.72
Radial artery occlusion	3 (3.1%)	0 (0%)		0.25
Others	1	1		
Hand pain	0	2		
Local numbness	1	0		
Ecchymosis				
Peak systolic velocity of radial artery (cm/s)(median, ISIQ)	64 (6.2)	67 (6.5)		0.09
Abnormal peak systolic velocity (n,%)	10 (10.5)	8 (9.8)		0.86
Abnormal flow pattern (n,%)	3 (3.2)	6 (7.3)		0.3
Intra hospital cardiovascular Major events				

CRA group while no one from the DRA group showed this complication (p = 0.25). In two of three patients with ultra-sonographic signs of radial artery occlusion, the proximal radial artery pulse was still palpable; but the distal pulse was not palpable in all these patients. All cases of occlusion were showed in coronary angiography with 5 F arterial sheath and in procedure without spasm of the artery and without previous radial cannulation.

3.8. Radial artery diameter

The median radial artery diameter was 2.2 ± 0.3 mm in males, 2 ± 0.32 mm in females (p = 0.001) and 2.3 ± 0.40 mm for the whole study population. The median diameter of the radial artery diameter was higher in the DRA group than in the CRA group (2.2 mm vs 2.1 mm; p = 0.007). But there was no statistically significant difference of the median radial arteries between patients with successful cannulation and those with failed cannulation (2.2 ± 0.3 mm vs 2 ± 0.49 mm; p = 0.7). The median diameter in patients who showed spasm of the radial artery seems to be smaller compared to those without spasm but without any significant difference (2 ± 0.16 mm vs 2.2 ± 0.3 mm, p = 0.077).

3.9. Spectral doppler analysis

Cardiovascular risk factors did not impact the Doppler parameters. Spectral analysis revealed abnormal flow pattern in eight from the DRA group and 11 patients from the CRA group (p = 0.8). The median peak systolic velocity for the first group was 67 cm/sec and 64 cm/sec for the second group(p = 0.09). Abnormal peak systolic velocity was noted in 12 cases of CRA group and in 9 cases of DRA (p = 0.73). Failure cannulation as well as failure procedure were associated with abnormal peak systolic velocity (p = 0.023 and 0.007, respectively). Abnormal peak systolic velocity as well as abnormal flow pattern were shown with 5 F sheath (p = 0.001 for both).

3.10. Cardiac events

There were no procedural deaths, and no patient referred to an emergency bypass surgery. One case of very early stent thrombosis occurred in a patient from the DRA group and was approached by a contralateral conventional radial approach. The reason of thrombosis had not any relation with the procedural access.

4. Discussion

The distal radial access is a new approach for percutaneous cardiac procedures. Many operators suggest the benefits of this access over the standard radial access including easier left-sided access for aorto-coronary grafts, future proximal radial artery preservation, shorter time hemostasis and patient and operator comfort. However, few studies had compared the two approach and the published results remain controversial and limited [6–11].

Therefore, we conducted this observational study and we demonstrated that the success rate and local complications of DRA are similar to those of CRA, when performed after few months of learning.

Our population was heterogeneous including not only complex procedures as left main PCI, primary PCI but also procedures performed in patients with high risk of tortuosity and vascular difficulties like octogenarian patients as well as elderly people and patients on hemodialysis. This last setting could incite operators to use the distal access, as it will preserve proximal artery for a future fistula. In various studies, stable CAD was the most frequent clinical presentation (87,6%) [12]. Operators avoid access via the distal radial in an emergency context. In the literature, acute coronary disease approached by DRA, represented only 3.8% of procedural indication [12]. Only 4 cohorts tried DRA in patients with STEMI with no significant difference in terms of clinical adverse events. In our study, we approached 37 patients (45%) with acute coronary artery disease by DRA with good results.

Cannulation failure is the major criterion on which the various studies have focussed. In the pilot study of Kimeneij et al. [5], the authors reported a cannulation failure rate about 11%, which is a high rate compared to the recent cohorts. In our trial, cannulation failure occurred in 4.8% in the CDA group and it was similar to the CRA group (2.1%, p = 0.15). It was due to failure of puncture or inability to advance the wire. Nevertheless, the only randomized study comparing these access [7] showed a high cannulation failure in DRA group (30%) against only 2% in the CRA group (p < 0.001). The reasons advanced by the authors of this lower success rate are smaller diameter of the radial artery in anatomical snuffbox with increased risk of vasospasm, increased tortuosity at this level leading to inability to advance the wire, obesity if approached by left side, less stable position of the hand and finally the learning curve. In a recent meta-analysis of five studies (4 observational and 1 randomized) including 6746 patients and comparing the two approach, the authors showed a similar cannulation failure rate (5.26% in CRA group versus 3.75% in DRA group; RR = 1.36; 95%CI [0.41–4.48]; p = 0.62). The discrepancy between observational studies and randomized study testifies to the importance of the selection of patients. Default ultrasound-guided technique and improvement of the learning curve may increase the success rate over the time and minimize the risk of puncture-mediated vasospasm.

In our cohort, the left approach was more used in DRA patients. It raises the value of distal radial access when approach by the left side seems to be unavoidable [5], such right radial occlusion, arteria lusoria, post-coronary artery bypass grafting patients requiring left internal mammary artery angiography … It gives better comfort for interventional cardiologist and right-handed patients.

Studies comparing time of cannulation showed controversial results. In a recent Turkish trial, transradial access time in the DRA group was longer than in the CRA group (46.85 ± 2.41 sec versus 36.66 ± 5.16 sec, $p = 0.008$) [6], these findings were in agree with those of another Greek study (269 ± 251 sec vs 140 ± 161 sec, $p < 0.001$) [7]. In our population, the time of cannulation was similar in the two approaches and was comparable to Turkish population for the CRA approach. In fact, we start the study after a three months of learning; Lee et al. had already showed in a large prospective study that the learning curve for puncture time stabilized after approximately 150 cases [13]. Anyway, Coughlan et al had showed that this time doesn't extend the total duration of the procedure [14].

Our trial demonstrated that coronary procedure through the DRA failed more frequently than those through the CRA (12% versus 2%, $p = 0.008$). All procedure failures in the CRA group were due to a cannulation failure, while it was due in the DRA group to either cannulation failure (four cases) or lack of support (one case) and artery spasm resulting in changing the first approach (three cases).

In our study, although radial artery diameter was higher in DRA group, vasospasm was similar between the two groups ($p = 0.54$); but access site switch was higher in DRA patients. Studies showed different results: Koutouzis and al [7] found a similar rate (4 patients in CRA, 3 patients in DRA, $p = 1$) but without access site switch. While, in the Turkish study [6], vasospasm was described rather with CRA (4 cases, $p < 0.001$), it also required crossover to a new access and it was explained by an alpha-1 adrenoreceptor contained in a medial layer of radial artery. In the recent meta-analysis of 5 studies, there was no difference between the two techniques in regard to radial artery vasospasm (1.42 versus 3.84%, RR = 0.91; 95%CI 0.32–2.62; $p = 0.86$) [8].

The outcome of coronary intervention (PCI) was similar for DRA et CRA groups. All coronary arteries were treated in both group without cardiac events. The safety and feasibility of DRA for stent implantation but also for Fractional Flow Reserve and coronary rotablator had been reported in previous studies [15]. Some operators have gone further and they proved the efficacy of DRA in extra-cardiac interventions such as dural arteriovenous fistula embolization, carotid artery stentings, stroke thrombectomy … [16].

Radial artery occlusion is the most common complication of conventional radial access; it's reported by different authors to occur in 1.5–33% of cases, shortly after the procedure [17]. The true incidence could be underestimated because it is asymptomatic in the majority of cases [18], fortunately this complication isn't definitive and the occlusion is reversible in 60% of cases within 1–3 months [19]. In our study, three cases (3%) of proximal radial artery occlusion, detected by ultrasonography, were reported in the CRA group and no one in the DRA group. In fact, the site of puncture in anatomical snuffbox is located beyond the bifurcation into the deep palmar arch and in case of occlusion of distal radial artery, the flow of proximal radial artery will be provided by the superficial palmar arch. In series of DRA, local radial artery within the anatomical snuffbox occlusion rate was noted in only 0–3.1% of cases [5,20,21] and forearm radial artery occlusion was showed in less than 0,5% of cases [20]. Thus, DRA seems to be safely in hemodialysis patients and candidates for coronary bypass who required radial graft [22]. In the recent meta-analysis comparing conventional and distal radial access, the rate of radial artery occlusion was lower with DRA (2.30 versus 4.86%, RR = 0.51; 95%CI 0.32–0.81; $p = 0.004$) as compared to CRA, the risk of this complication was reduced by half.

To better illustrate the mechanism of radial artery occlusion during puncture, Kaledin et al [20] used OCT-imaging to show pathological changes in the wall of radial artery. They demonstrated that the post-catheterization impairment of the radial artery could consist in not only occlusion but also stenosis, hence the idea of Doppler examination and measuring peak systolic velocity. Our study showed that the cannulation failure is correlated with stenosis of radial artery revealed by an abnormal systolic peak velocity. Two hypotheses could therefore be advanced: either cannulation failed because of pre-existing stenosis of the radial artery or the multiplication of attempts to puncture the radial artery lead to its stenosis or dissection.

Local numbness, reported in two patients (2.4%) of DRA group, was due to the proximity of radial nerve to the radial artery in anatomical snuffbox. This rate was less than 1% in prior reports [5,21].

No major complication was reported in our study. In the literature, major complications occurred in 2.4% DRA procedures of which bleeding/hematoma (18.2%) were the most frequent [12]. Some cases of dissection and arterio-venous fistula had been reported. In cohorts comparing DRA to CRA, there was no significant difference in overall complications [20].

This study evaluated radial artery diameter in Tunisian population, and ultrasound revealed diameters of 2.2 ± 0.3 mm for men, 2 ± 0.32 mm for women, and 2.3 ± 0.40 mm overall. These findings

were similar to those in Turkish population where the mean radial artery diameter by angiography was reported to be 2.3 ± 0.38 mm for men, 2.1 ± 0.42 mm for women, and 2.3 ± 0.40 mm for the whole study population [23]. It was different from radial artery diameter by ultrasonography in South Korean, Chinese and Japanese populations [24] (2.60 ± 0.41 mm, 2.37 ± 0.57 mm, 2.57 ± 0.58, respectively). These results support the hypothesis of racial variation advanced by Okuyan et al. suggesting a larger radial artery in Asiatic populations [23]. Furthermore, the median proximal radial lumen diameter in women compared with men (p = 0.001) makes access slightly more challenging in women.

This study also compared diameter in forearm radial artery after catheterization in distal and conventional radial approaches. It showed that this diameter of radial artery in forearm is larger after DRA than CRA. Mizuguchi et al. [21] found that forearm radial artery diameter after DRA was significantly larger one day after the DRA than at baseline which could be explained by a mechanical distension secondary to the sheath.

4.1. Limitations

Certainly, the main limitations of this study are the reduced number as well as the observational, non-randomized feature. Thus, the cardiologist could choose the most suitable patients for distal radial approach.

Ultrasound exam was done only after procedure so we have no idea about the baseline diameter and the Doppler flow of radial artery before catheterization [21]. In addition, we did not take into account factors that can influence these measures (heat, vasodilator drugs …). On the other hand, patients with radial occlusion were not rechecked to better study the reversibility of the involvement of the radial artery.

5. Conclusions

The distal radial approach seems to be an interesting technic in cardiac catheterization. It is feasible and safe for coronary angiography as well as interventions. The success rate depends certainly on patient's selection and operator's expertise. In our study, the rate of procedural failure was higher with DRA but we included a high-risk population and the experience of operators was limited to only 3 months. Obviously, this approach should be added to the contemporary arterial access options in our cathlab mainly in specific settings with need to preserve radial artery (hemodialysis, radial graft …). A further study after a longer learning period is required.

Disclosure statement

No potential conflict of interest was reported by the authors.

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