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Conventional transradial access versus distal transradial access for coronary angiography and interventions

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Abstract

Introduction
For so many years, femoral access has been the standard access for all interventional cardiologists performing coronary angiography and percutaneous coronary interventions. In the past 15 years, radial access gained more fame over femoral access as it has a lower risk of bleeding and it is more convenient to patients due to early mobilization and less hospital stay. Recently, the distal transradial access in the anatomical snuffbox has emerged as a new access for coronary procedures that carries some advantages over the standard proximal transradial access. These advantages include radial artery preservation in patients who may use radial artery graft for coronary bypass surgeries and those with end-stage renal disease who may use the radial artery for arterio-venous fistula.

Aim
The aim of this study is to compare the feasibility, safety, and complications of coronary angiography and intervention between distal transradial and conventional transradial access.

Patients and methods
This study was conducted between January 2019 and June 2020 on 100 patients who presented with chronic coronary syndrome previously known as stable angina to the outpatient clinic of our center who were scheduled for coronary angiography with possible coronary angioplasty if indicated. These patients were categorized into two groups, group A that consisted of 50 in which coronary angiography was done by conventional transradial route and group B that consisted of 50 in which coronary angiography was done by distal transradial route. Their demographic features and complications were recorded.

Results
Our results showed that patients who had their procedures through conventional radial access had more hematoma, bleeding, hand ischemia, and loss of radial artery than those who had their procedures done through distal transradial access.

Conclusion
From our results, we can conclude that distal transradial access in the anatomical snuffbox for coronary angiography and intervention is a better alternative, safe, and feasible option in comparison to conventional transradial access for both patients and operators.

Keywords: Coronary angiography, distal radial access, percutaneous coronary interventions, radial access

Introduction

For so many years, femoral access has been the standard access for all interventional cardiologists performing coronary angiography and percutaneous coronary interventions. In the past 15 years, radial access has gained more fame over femoral access as it has a lower risk of bleeding and it is more convenient to patients due to early mobilization and less hospital stay. Recently, the distal transradial access in the anatomical snuffbox has emerged as a new access for

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coronary procedures that carries some advantages over the conventional proximal transradial access. These advantages include radial artery preservation in patients who may use radial artery graft for coronary bypass surgeries and those with end-stage renal disease who may use the radial artery for arterio-venous fistula.

Many studies have compared the femoral approach versus the radial approach for coronary angiography and interventions. The radial access has proved to be superior in terms of safety and patient convenience with fewer bleeding complications and fewer hospital stays [1,2]. Many operators prefer using the right radial artery as they stand at the right side of the patients. However, in cases of right radial artery occlusion, weak right radial arterial pulsations, radial artery loops, and absent right radial artery if it was used in coronary artery bypass graft surgery, the operators make use of the left radial artery [3]. However, left radial access can be more difficult for the operator as he should lean over the patient to obtain access to the left radial artery. This position may be inconvenient and may lead to crossover to other access sites. The use of left distal transradial access has solved this problem and provided a comfortable position for both the patient and the operator. The puncture site is located in the anatomical snuffbox on the dorsal side of the hand [4].

Aim of the work

The aim was to compare conventional transradial access versus distal transradial access for coronary angiography and angioplasty procedures regarding feasibility, safety, and complications.

Patients and methods

This study was conducted between January 2019 and June 2020. It included 100 patients who presented to the outpatient clinic of our center with chronic coronary syndromes (stable angina) who were scheduled for coronary angiography with possible percutaneous coronary angioplasty if indicated. These patients were categorized into two groups, group A consisted of 50 patients in which coronary angiography was done by conventional transradial route and group B consisted of 50 patients in which coronary angiography was done by distal transradial route. All patients were subjected to the following history taking stressing on risk factors of coronary artery diseases, which are diabetes mellitus, hypertension, hyperlipidemia, cigarette smoking, and family history of coronary artery disease. Examination stressing the measurement of blood pressure, auscultation for the presence of additional sounds and murmurs, and auscultation of the back for the presence or absence of rales. Twelve-lead electrocardiography and biochemical evaluation for determination of lipid profile, blood glucose level, and renal function was also performed. After obtaining patients' informed consent as per hospital protocol, coronary angiography was performed, coronary arteries were viewed in multiple projections, and the major coronary arteries and their secondary branches were considered separately: left main coronary artery, left anterior descending, circumflex, right coronary artery, and the main secondary branches such as diagonal, obtuse marginal, and posterior descending arteries. For the patients who underwent percutaneous coronary interventions, preprocedural administration of an unfractionated heparin bolus dose of 70 UI/kg. All patients had been pretreated with acetylsalicylic acid plus a loading dose of clopidogrel (300 mg) and were discharged on dual antiplatelet therapy consisting of acetylsalicylic acid 75 mg tablet once daily together with clopidogrel 75 mg once daily and atorvastatin 40 mg tablet once daily for 12 months at the discretion of the operator and depending on the stent implanted. Before the procedure, bilateral radial pulses had been evaluated by a physician for group A and radial artery in the anatomical snuffbox for group B.

For group A patients, a conventional transradial approach was used; after local anesthesia with 2% lidocaine, a 6F sheath was advanced over a 0.022″ guidewire. In group B patients, the distal transradial approach was used after local anesthesia with 2% lidocaine. In both the groups, the radial artery was cannulated with a 19-gauge needle. The use of vasodilating medical cocktail containing 5 mg verapamil and 50 μg nitroglycerin was given. Hemostasis was achieved with external compression with a wrist band (TR band). The patients were allowed to ambulate 2 h after intervention in both the groups. All results were tabulated and statistical analysis was performed using IBM compatible PC and the statistical software package namely (SPSS Inc., IBM, New York, USA). The results were analyzed by suitable statistical methods, which include mean, standard deviation, and Student's *t*-test. Data were considered significant at a *P* value less than 0.05, highly significant at a *P* value less than 0.001, and not significant at a *P* value more than 0.05.

Results

The work was done on 100 patients; these patients were divided into two groups:

(1) Group A included 50 patients in which coronary angiography and intervention were done by conventional transradial route; 21 patients were hypertensive, 17 patients were diabetics, 16 patients were smokers, 16 patients were hyperlipidemic, and 10 patients with a positive family history of coronary artery disease.
(2) Group B included 50 patients in which coronary angiography and intervention were done by conventional transradial route; 22 patients were hypertensives, 16 patients were diabetics, 15 patients were smokers, 15 patients were hyperlipidemic, and 11 patients with a positive family history of coronary artery disease.

From the previous data shown in Table 1 and Fig. 1 on studying the risk factors of coronary artery diseases among patients in

the study, there was no significant difference between the two groups as regards hypertension, diabetes mellitus, cigarette smoking, hyperlipidemia, and positive family history of coronary artery disease.

Angiographic characteristics among groups A and B

(1) Group A: among patients in group A, we found 11 patients with normal coronary arteries, 16 patients with one vessel disease, 14 patients with two-vessel disease, and 9 patients with multivessel disease.
(2) Group B: among patients in group B, we found 13 patients with normal coronary arteries, 14 patients with one vessel disease, 13 patients with two-vessel disease, and 10 patients with multivessel disease.

From the previous data present in Table 2 and Fig. 2 on studying the angiographic characteristics of the patients in the study, we found no significant difference between the two groups as regards angiographic characteristics and severity of coronary artery diseases.

Comparison of procedural parameters between the two groups

(1) Group A: among patients in group A, the mean access time was 5.3 min, mean fluoroscopy time was 6.2 min, and mean procedural time was 27.9 min.
(2) Group B: among patients in group A, the mean access time was 5.9 min, mean fluoroscopy time was 6.5 min, and mean procedural time was 28.2 min.

From the previous data present in Table 3 and Fig. 3 on studying the procedural parameters in the study, we found no significant difference between the two groups as regards procedural parameters namely the mean access time, the mean fluoroscopy time, and the mean procedural time.

Comparison of complications in between the two study groups

(1) Group A: among patients in group A, 2 patients had a major hematoma, 4 patients had a minor hematoma, 6 patients had bleeding complications, and 1 patient had a pseudoaneurysm.
(2) Group B: among patients in group A, 1 patient had a major hematoma, 3 patients had a minor hematoma, 4 patients had bleeding complications, and 1 patient lost the radial artery.

From the previous data present in Table 4 and Fig. 4 on studying the comparison between the two groups in the study, we found a significant difference between the two groups as regards complications, namely, the major hematomas, the minor hematomas, bleeding complications, hand ischemia, and loss of radial artery with the tendency to decrease the rate of complications with distal transradial route.

Table 1: Distribution of risk factors among groups A and B

Item	Group A	Group B	*P*	Significance
HTN	21	22	0.331	Insignificant
DM	17	16	0.339	Insignificant
Smokers	16	15	0.329	Insignificant
Hyperlipidemia	16	15	0.311	Insignificant
Positive family history	10	11	0.359	Insignificant

DM, diabetes mellitus; HTN, hypertension.

Table 2: Angiographic characteristics among groups A and B

Item	Group A	Group B	*P*	Significance
Normal coronaries	11	13	0.252	Insignificant
One vessel disease	16	14	0.269	Insignificant
Two vessel disease	14	13	0.423	Insignificant
Multivessel disease	9	10	0.417	Insignificant

Table 3: Comparison of procedural parameters between groups A and B

Item	Group A	Group B	*P*	Significance
Access time (min)	5.3	5.9	0.091	Insignificant
Fluoroscopy time (min)	6.2	6.5	0.319	Insignificant
Procedural time (min)	27.9	28.2	0.411	Insignificant

Table 4: Comparison of complications between groups A and B

Item	Group A	Group B	*P*	Significance
Major hematoma	2	0	0.011	Significant
Minor hematoma	5	1	0.001	Significant
Bleeding complications	7	1	0.001	Significant
Hand ischemia	2	0	0.011	Significant
Loss of radial artery	2	0	0.011	Significant

Discussion

Comparison between radial versus femoral access or radial versus ulnar access for coronary angiography and angioplasty procedures have been frequently studied [5]; on the other hand, the comparison of distal radial versus conventional radial access for the same procedures was not frequently addressed. The choice of the distal radial artery for coronary angiography and angioplasty procedures is safe and convenient for many patients.

The advancement of the catheters through the forearm vessels and engagement at the coronary ostium is easier through the left arm approach but most of the operators may prefer the right-sided puncture as they stand by the right side of the patients, so the right arm was used for both conventional radial and distal radial artery approaches in our study. At the start, while obtaining the vascular access for group A patients, the conventional transradial group, the patient's right hand was kept at the side of the body in the supine

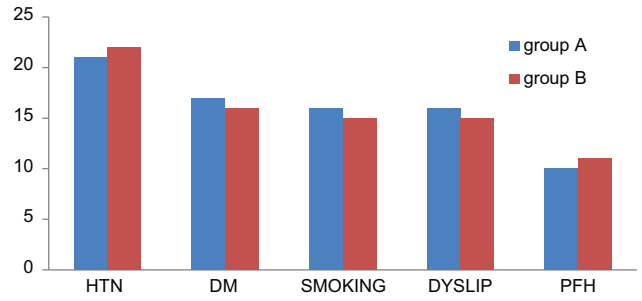

Figure 1: Distribution of risk factors among groups A and B.

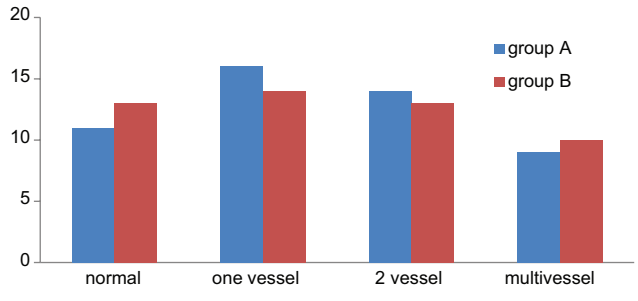

Figure 2: Angiographic characteristics among groups A and B.

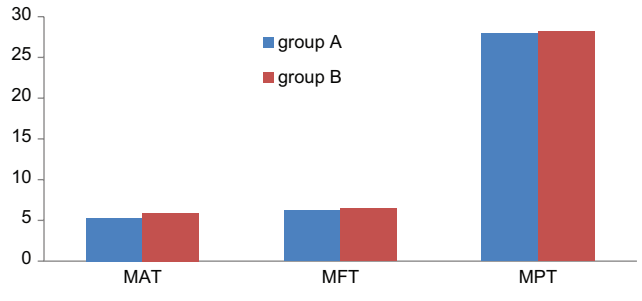

Figure 3: Comparison of procedural parameters between groups A and B. MAT, mean access time; MFT, mean fluoroscopy time; MPT, mean procedural time.

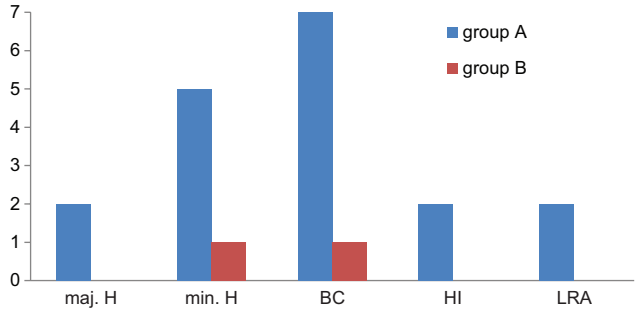

Figure 4: Comparison of complications between groups A and B. Maj. H, major hematoma; min. H, minor hematoma; BC, bleeding complications; HI, hand ischemia; LRA, loss of radial artery.

position with the hand kept dorsiflexed. For group B patients during distal transradial access, the patient's hand was put in a semiprone position. After the puncture, a hydrophilic radial sheath of 6 French was introduced in all patients. Kaledin *et al*. (unpublished observation) showed that distal transradial access is safer than conventional transradial access regarding hand ischemia, as the palmer arch was kept intact during the distal transradial approach. Our study also supports their findings where two patients from the conventional transradial group developed hand ischemia but none of the distal transradial access group had this complication. Several studies involving the conventional transradial approach showed that, after the catheterization procedure, radial artery occlusion was reported to be between 1 and 10% in patients undergoing catheterization; we experienced two cases by conventional transradial access and none from distal transradial access, which is concordant with these findings [6]. Also, many collateral arteries connecting the superficial and the deep palmar arches can maintain the hand perfusion in case of hand vessel occlusion [7]. From the anatomy of the palmar arches, the use of distal transradial access may prevent any procedure-related vascular occlusion. Also, this may keep the radial artery intact to be used in the future as a free graft in coronary artery bypass grafting surgeries or creating arterio-venous fistula for end-stage renal disease patients who may need chronic hemodialysis. Regarding bleeding complications and hematoma formation, there was no major hematoma developed in the distal transradial group; this shows that this approach is safe in terms of hemorrhagic complications compared to the conventional transradial approach, and this is supported by other studies (Kaledin *et al*., unpublished observation) [3].

Conclusions

Distal radial artery access for coronary angiography and angioplasty procedures is safe, convenient for the patients, and relatively free from major complications compared to conventional transradial access. It requires proper patient selection, preparation to achieve success and avoid failures, and cross over to other access sites.

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Conflicts of interest

There are no conflicts of interest.

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