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RESEARCH ARTICLE

ISCHEMIC HEART DISEASE AND DIAGNOSTIC CORONARY ANGIOGRAPHYEPIDEMIOLOGICAL DATA AND FEMORAL VS. RADIAL APPROACH : A SERIES OF 100 CASES

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Abstract

Introduction: The use of radial access for coronary interventions offers advantages such as reduced access-site bleeding and improved patient comfort. However, the learning curve for radial access and conflicting findings regarding outcomes in previous studies have influenced its widespread adoption. This study aimed to comprehensively assess the effects of radial access compared to femoral access in patients with ischemic heart disease.

Materials and Methods: A retrospective analysis was conducted on 100 patients who underwent diagnostic coronary angiography at Ibn Sina University Hospital. Patient demographics, clinical indications, angiographic data, and complications were compared between the radial and femoral access groups. Statistical analysis was performed using SPSS software.

Results: The study included 45 patients in each group, with an average age of 63 years. Male patients accounted for 67% of the study population. The most common indications for coronary angiography were acute coronary syndrome (41%), heart failure (28%), stable angina (17%), and unstable angina (10%). The angiographic findings revealed that 79% of patients had pathological coronary angiograms, with bi-troncular involvement being the most prevalent (40.5%). Vascular complications occurred in 4% of cases, including a femoral fistula requiring vascular surgery.

Conclusion: The study findings aligned with previous research, demonstrating that radial access resulted in fewer vascular and hemorrhagic complications compared to the femoral approach. However, the radial route presented challenges such as a longer procedural duration and increased radiation exposure. The decision between radial and femoral access should consider the operator's experience, patient preference, and clinical factors.

Introduction:-

The use of radial access, as an alternative to femoral access, for coronary interventions reduces access-site bleeding because of the easily compressible and superficial anatomy of this artery and improves patient comfort, with early mobility after procedures (1). However, radial access may have a longer learning curve to develop technical skills, thus requiring higher procedure volumes to achieve and maintain proficiency (1). In addition, large multicenter studies investigating the value of the radial compared with the femoral approach have focused on patients with acute

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coronary syndromes (ACS) and have come to different conclusions with regard to ischemic, bleeding, and combined outcomes. Nevertheless, the adoption of radial access has undergone a rapid increase (2). This may be driven partly by evidence from earlier trials showing that radial access may reduce bleeding and has the potential to improve clinical outcomes (3,4). In the modern era, the superiority of radial access over femoral access may be attenuated because of smaller arterial sheaths and targeted anticoagulant agents that reduce bleeding risk. The aim of this study was to provide a comprehensive and quantitative assessment of the effects of radial access compared with femoral access for coronary interventions in patients across the whole spectrum of ischemic heart disease.

Materials and Methods:-

The study population was drawn from 100 patients admitted to Ibn Sina University Hospital for diagnostic coronary angiography between January 2016 and December 2018. Written informed consent was obtained from every patient. The study was retrospective. The patients had their procedure performed either from the radial or femoral access according to operator preference and the results were compared. The study group included mainly patients who underwent coronary angiography for stable angina, unstable angina and acute coronary syndrome. Patient were excluded if the indication was the assessment of coronary anatomy before valve surgery, unexplained fever, untreated infection, severe anaemia with haemoglobin less than 8g/dl, severe electrolyte imbalance, severe active bleeding, acute renal failure, or international normalised ration (INR) > 1.4.

All patients were prepared according to the American College of Cardiology/American Heart Association (AHA/ACC) task force on Cardiac Catheterization Laboratory Standards. (5) Patients at high risk for contrast induced allergic reaction had premedications by IV hydrocortisone. Routine laboratory investigations including urea and electrolytes, full blood counts,renal function tests, and coagulation profilewere performed. Left heart catheterisation through the radial approach was performed with a dedicated 5 French sheath, 5 French diagnostic catheters for left and right coronaries. All femoral catheterisations were performed using 5 French sheath and diagnostic catheters, usually Judkins catheters. The artery sheath was immediately removed at the completion of the procedure and haemostasis for the radial access was obtained by local compression and a tight pressure bandage for 3 hours. Patients were allowed to ambulate immediately unless their clinical status dictated otherwise. In the femoral group, the sheath was removed and haemostasis was obtained using manual compression for at least 10 minutes. These patients remained in bed rest for 6–8 hours.

Statistical Analysis:

Quantitative variables were presented as means with standard deviations or medians with interquartile intervals. Statistical analysis were performed using SPSS software (Version 22.0; SPSS Inc., Chicago, III).

Results:-

Out of the 100 patients, the femoral group included 45 patients and the radial group 45 patients. The average age was 63 years old, with extremes ranging from 38 to 89 years old.Our study included 67% of male and 33% of female patients. The baseline demographic characteristics are shown in Table 1.

	Femoral group	Radial group
Age (years)	62	62
Male Gender (%)	57,7	74,6
Hypertension (HTN) (%)	20	28
Diabetes mellitus (DM) (%)	20	27
Dyslipidemia (%)	10	8

Table 1:- Demographic characteristics of both groups.

The study group included mainly patients who underwent coronary angiography for acute coronary syndrome in 41% of cases, heart failure in 28% of cases, stable angina in 17 % of cases, unstable angina in 10 % of cases.

Electrocardiography showed ST segment elevation in 28% patients and T wave repolarization disorder in 21% patients.

The presence of segmental kinetic disorders was noted in 70% of patients in echocardiography.

Crossover occurred in 3 patients in the radial group. The angiographic data are shown in Table 2.

The total vascular complication rate was 4 %. It was a femoral fistula which required vascular surgery.

	Study group
Coronary artery spasm	1%
One -Vessel Disease	28%
Two-Vessel Disease	32%
Three-Vessel Disease	18%

Table 2:- Angiographic characteristics.

Discussion:-

The average age of our patients was 63 years old, ranging from 38 to 89 years old; this is close to the Mercuristudy(6). Before the age of 65 to 70, men are much more exposed to cardiovascular events(7).

The average age of the patients who underwent coronary angiography via the radial route and via the femoral route is equal which is closed to the results the RIVAL study(8) and the UK study(9). The average age in our series was 62 years in both categories.

The percentage of men who underwent coronary angiography by the radial route in our series was 74.6%, which is comparable with the RIVAL study where 74.1%(8) of men underwent coronary angiography by the radial route and the UK study with 76.1%(9).

However, for the femoral route, our results were different from those found in the literature.

Studies	**Our series**		**RIVAL**		**UK**	
Approaches	**Radial**	**femoral**	**Radial**	**femoral**	**Radial**	**femoral**
Averageage	62	62	62	62	62.6	63.7
Number of men (%)	41 (74.6%)	26 (57.7%)	2599 (74.1%)	2561 (72.9%)	13,731 (76.1%)	20,454 (72.8%)

Table 3:- Comparison of demographic characteristics in both groups.

In our series, diabetes was present in 47% of patients (27% for those who underwent radial coronary angiography). These results are similar to those observed in the RIVAL study.

In the UK study(9), 40.1% of cases who underwent radial coronary angiography had dyslipidaemia, compared with 38.2% of those who underwent femoral coronary angiography.

Since the lipid profile is not systematic in our service, the analysis of this FDRCV could not be completely carried out.

In our study, 48% of the patients were hypertensive, 28% of whom benefited from coronary angiography by the radial approach.

Smoking is present in our series in 32% of patients undergoing radial coronary angiography and 36% in those undergoing femoral coronary angiography. These results are consistent with the RIVAL study(8)where we find 30.9% by the radial route and 31.2% by the femoral route. Smoking wasexclusively male in our study.

Studies	**Our series**		**RIVAL**		**UK**	
Approaches	**Radial**	**femoral**	**Radial**	**femoral**	**Radial**	**femoral**
Diabetes	27 (27%)	20 (20%)	781 (22.3%)	722 (20.5%)	2,210 (12.3%)	4,196 (14.9%)
hypertension	28 (28%)	20 (20%)	2118 (60 4%)	2076 (59 1%)	7,232 (40.1%)	10,775 (38.4%)
Hyperlipemia	8	10	_	_	7,558	10,736

					(41.9%)	(38.2%)
familyhistory	–	–	–	–	6,321 (35.0%)	8,854 (31.5%)
Smoking	32%	36%	1083 (30 9%)	1097 (31 2%)	7,517 (41.6%)	9,730 (34.6%)

Table 4:- The distribution of modifiable cardio vascular risk factors (CVRF) according to approaches.

Coronary angiography was performed in all our patients. The radial approach was the most used in 55% of cases. 21% of our patients had normal coronary angiography.

In our series, 79% of the coronary angiograms were pathological, bi-troncular involvement was the most predominant (40.5%), followed by mono-troncular involvement (35.44%).

However, in Pr.LAKHAL's study(10), the mono vessel disease was the most predominant in 41.5% of cases.

The operators' experience and confidence in using the radial and femoral approach is critical to decision-making. The radial route is often technically more difficult than the femoral route and requires a learning curve (11).

The patient's preference for vascular access is taken into consideration and is discussed with the patient when consenting to invasive coronary procedures (12).

In our study, the femoral approach was used in 45% of patients, including 93.3% for the right femoral.

The results of 4 large trials (13-16) have consistently shown that crossover from the radial approach to the femoral approach is more frequent: 6.3% radial versus 1.7% for the femoral approach. Larrazetet al. (17) found a conversion rate to the femoral route of 10%.

This is due to anatomical differences, the radial artery being much smaller than the femoral artery, frequent spasms and tortuosity.

In the meta-analysis by Agostini et al.(18), the failure of the procedure by the radial approach was 7.2% versus 2.4% by the femoral approach ($p < 0.001$), mainly due to a failure of the puncture and/or the difficult progression of the catheters in the radial. This is partly explained by the anatomical variations of the radial artery (14–23%). In the RIVAL study 7.6% of crossover was recorded for the radial approach against 1% for the femoral approach(8).

This is especially beneficial for patients who have back problems and cannot lie flat for several hours, which is often the case if the femoral access route is used(19). In addition, the length of stay is shorter for patients undergoing radial procedures, reducing hospital costs. Delay in exit is often attributed to complications related to femoral access. These patients often require bed rest, observation or even invasive treatment.

Femoral complications are more likely in patients with peripheral vascular disease or calcified peripheral arteries(20).

The presence of peripheral vascular disease may make catheter manipulation difficult and hemostasis may be difficult to achieve after the procedure. In these patients, vascular access through the radial artery is desirable (21).

The radial artery is superficial and easily compressible, which allows hemostasis which can be more difficult with the femoral route. Therefore, in these circumstances and particularly in patients who regularly take anticoagulants, vascular access should be considered via the radial route (22).

Radial spasm, defined by a reduction of more than 75% of the lumen of the artery, is reputed to be more frequent in women and partly explains the lesser use of this approach. Numasawaet al.(23) reported a rate of occurrence of arterial spasm of 11.2%, with a prevalence twice as high in women.

Complications of coronary angiography between the radial and femoral approach are compared on bleedings, hematomas, aneurysms and arteriovenous fistulas.

Bleeding is associated with adverse consequences, including stroke and death. The radial approach for coronary angiography and percutaneous coronary intervention (PCI) has demonstrated a reduction in major bleeding compared to the femoral approach. There is also a reduction in overall deaths, myocardial infarctions (MI) and cerebrovascular accidents (CVA), the length of hospitalization was significantly shorter with the radial approach (8).

In our series of 100 patients, only one patient presented a vascular complication via the femoral route: Arteriovenous fistula treated by surgery, which shows a reduction in vascular and hemorrhagic complications via the radial route.

Both the MATRIX (24) and RIVAL studies provided compelling results regarding the superior effectiveness of the radial route for PCI compared to the femoral route.

The RIVAL study is the largest randomized trial comparing the radial to the femoral approach for PCI. In this trial, 7021 patients diagnosed with ACS were randomized to radial or femoral access. There was no significant difference in the composite of 30 days of death, MI, stroke, or major hemorrhage with the radial route and the femoral route; 3.7% and 4% respectively.

However, vascular complications were significantly fewer with the radial approach.

In the MATRIX study(24), the same cohort of patients from the RIVAL trial was analyzed. The results of the use of the femoral approach and the radial approach for patients having suffered myocardial infarction with or without ST-segment elevation were analyzed. Fewer deaths, myocardial infarctions, strokes, and major bleeding occurred in patients who underwent the procedure via the radial approach than via the femoral approach, but this effect was more pronounced in patients with STEMI than in patients who have undergone NSTEMI. In patients with STEMI, the composite score was 2.7% in radial cases versus 4.6% in femoral cases.

Our series agrees with the RIVAL and MATRIX study in the reduction of vascular and hemorrhagic complications by the radial approach compared to the femoral approach.

Conclusion:-

The radial access site for coronary angiography is a valid approach that eliminates the local vascular complications and significantly shortens the hospital stay. Despite these advantages, radial vascular access is still more challenging with a longer duration of the gesture and greater irradiation than the femoral route.

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