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Research Article

WRIST OR GROIN SAFETY, COMPLICATIONS AND PREDICTORS. FEMORAL VS TRANS RADIAL CORONARY ANGIOGRAPHY

**Dr Mahmood ul Hassan^{1*}, Dr Bakhtawar Shah², Dr Shahsawar³, Dr Cheragh Hussain⁴,
Dr Abdur Rauf⁵, Dr Adnan Khan⁶, Dr Muhammad Hammad Sharif⁷**

^{1*}Professor Cardiology, Hayatabad Medical Complex Peshawar

²Medical Officer Cardiology, Hayatabad Medical Complex Peshawar

³Assistant Professor Cardiology, Hayatabad Medical Complex Peshawar

⁴Associate Professor Cardiology, Hayatabad Medical Complex Peshawar

⁵Assistant Professor Cardiology, Kuwait Teaching Hospital Peshawar

⁶Registrar Cardiology, Hayatabad Medical Complex Peshawar

⁷Resident Cardiology, Hayatabad Medical Complex Peshawar

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Abstract:

BACKGROUND: Coronary angiography is a lifesaving procedure but not immune to complication. Complication rate fall dramatically in the last decade but still mild to severe complication pop up globally. The route of angiography, operator experience, selection of patient, tool and hardware of angiography are main predictors of complication. We conducted a study at our center to evaluate the incidence and difference of complication of angiography from radial and femoral route.

OBJECTIVE: The aim of the study was to determine the difference in safety and efficacy between radial and femoral route for angiography.

METHODOLOGY: Patients who presented to our center for angiography were admitted in cardiology ward. Patients were prepared for the procedure overnight. Diabetic patient received normal saline over night at rate of 10ml /hour for 12 hours. Patient whose serum creatinine was ≥ 2 mg/dl were excluded from the list. Patient randomly divided into two groups, group 1 for radial artery approach and group 2 for femoral artery approach. Those patient in whom the radial route was not accessible due to any reason, cross over to femoral angiography. Patient demographic variable, duration of fluoroscopy, length of procedure, amount of contrast used, any complication during and after procedure, time to mobilization and duration of hospital stay were noted. These variables were analyzed on SPSS version 23 for mean, mode and any statistical significance. P value of ≤ 0.05 was considered statistically significant.

RESULTS: Total no of patients were 1111. There were 682(61.38%) male and 429(38.61%) female patients. Patient with co-morbidity were 418(37.62%), including diabetes, hypertension and chronic kidney disease. Mean age of patient for femoral procedure was 55.62 ± 10.28 vs. 54.31 ± 1.08 for radial procedure. Diabetic in femoral route procedure were 28.2% and 27.3% in radial route. About 48.5% were hypertensive in femoral route and 45.3% in radial group. Rate of complication were less in female gender for procedure from the radial route. Fluoroscopy time, radiation duration and CKD were noted having negative association with femoral route. Hospital stay was prolonged with femoral route. Pain, artery spasm and more contrast was noted in radial approach.

CONCLUSION: There was no significant difference in major complication between radial and femoral route.

Keywords: CAD, CKD, DAP, BMI, TVD, SVD, DVD, LMS.

Corresponding author:**Dr Mahmood ul Hassan,***Professor Cardiology, Hayatabad Medical Complex Peshawar**Email address: mahmoodhmc824@gmail.com, Phone number +923339175545,**Postal Address: Cardiology Department,
Hayatabad Medical Complex Peshawar.*

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INTRODUCTION:

Coronary angiography revolutionizes the management of cardiovascular diseases in the last three decades¹. But complications are part and parcel of procedure, angiography². New advances and development in gadgets made the procedure safe and easy and improved the overall management of the patients but procedure related complication still popping up and leading to procedure related morbidity and mortality^{3,4}. These complication needs to be tackled from various perspective to make the procedure safe and increase the efficacy.

Complication of angiography adversely affected by age, gender of the patient, comorbidities of patient, procedure time, gadgets for procedure, access site and last but not the least experience of the operator.⁵ No matter how equipped the catheterization laboratory is and what tremendous experienced the operator is, no procedure is totally immune to complication.

Femoral approach of angiography has its own advantages and disadvantages. There are pockets where femoral angiography is considered safe, convenient and efficacious both for operator and patient but its complication cannot be undermined.^{6,7}

Radial approach of angiography has decreased the complication rate in many aspects of the procedure.⁸ Hematoma which is a well-known complication of femoral route is almost negligible in radial approach⁹. Similarly, Arterio-venous fistula and retroperitoneal hemorrhage which is a dreaded complication of femoral route of angiography is no more seen with radial approach^{10,11}. However radial artery occlusion is one of the cumbersome complications of radial approach for angiography. Pain, spasm of radial artery and vasovagal response related symptoms mostly seen with radial approach.^{12,13}

Patient mobilization is soon after the procedure after radial approach, while patient's movement is restricted for 6 to 12 hours after femoral approach even if everything goes smooth. The incidence of other

complication related to procedure, varies with experience and gadgets of procedure.

We conducted this study to determine the difference in the rate of safety, efficacy and complications in radial vs. femoral procedures in a tertiary care hospital by different operators including from experienced operators to trainee in cardiology in a real-world scenario.

MATERIAL AND METHODS:

We conducted this study at our catheterization laboratory at Hayat Abad Medical Complex Peshawar from February 2018 till August 2019 after the approval from ethical committee.

Those patients, who presented to our center for angiography, informed consent from the patients was taken. Baseline investigation including full blood counts, renal function test, liver function test, random blood sugar, serum electrolytes and virology was done. Patients were prepared for the procedure overnight. Diabetic patient received normal saline over night at rate of 10ml/hour for 12 hours. Patient whose serum creatinine was ≥ 2 mg/dl were excluded from the study.

Patients were randomly divided into two groups. Group 1 for radial approach and group 2 for femoral approach. Those patient in whom the radial access was not available due to any reason, cross to femoral route.

Right radial was prepared by scrubbed and draped. After local anesthesia with 3ml Xylocaine 2%, puncture was done by Seldinger technique 2-3 cm above the wrist with 20 G cannula and needle assembly with through and through puncture of the radial artery. In case if first puncture failed than another attempt was made 1 cm proximal to the initial site. Gradually withdrawal of cannula was observed until blood spurt out. The needle was removed and 0.025-inch straight glide wire was inserted. Cannula is than removed. 6 French radial sheath along with dilator passed than removed from the sheath. Sheath flushed with saline and 2500 IU of heparin was

injected in the sheath. Sheath was also flushed with 200 IU of glyceryl trinitrate. With radial catheter both right and left coronary angiographies were done. If radial catheter fails to engage the vessel then right and left Judkin or Amplatz catheters were used to negotiate the vessel. Sheath was removed immediately after coronary angiography and hemostasis was secured by manual compression.

Right femoral was prepared by shaving if needed, scrubbed and draped. local anesthesia was given using 8-10 ml 2% Xylocaine. With 18 gauge needle, right femoral artery was punctured by Seldinger at 30 to 45 degree angle technique 2 cm below the inguinal ligament. Once femoral artery is cannulated, good arterial flow was ensured. A 0.035 inch J tip guidewire was than advanced through the needle into the femoral artery and 6 French femoral sheath passed. Sheath flushed with saline. With left and right Judkin catheter both left and right coronary angiography was recorded respectively. If they failed to engage the vessel then Amplatz catheter was used to engage the vessel and all standard views were recorded. Sheath was removed after the procedure and hemostasis was secured by pressure method. Patients were observed for any complication in the ward for next 24 hours. The procedure was performed by different consultant cardiologist and senior cardiology trainees. In both procedures, standard views were taken equal in number both for left coronary and right coronary system. Additional modified views were taken in case arterial course was inadequate.

Patient demographic variable age, gender, height, weight body mass index (BMI), duration of fluoroscopy, amount of contrast used, any complication like pain, spasm, local hematoma, perforation, retroperitoneal hematoma, vasovagal reaction, cardiac arrest, Iliac artery dissection/perforation during and after the procedure were recorded, time to mobilization and duration of hospital stay were noted and recorded on proforma. Variables collected were analyzed on SPSS version 23 for mean, mode and any statistical significance. P value of 0.05 was considered statistically significant.

Inclusion Criteria:

All patients in whom angiography was advised on the bases symptoms suggestive of coronary disease, acute coronary syndrome, aborted cardiac arrest or going for valvular surgery i.e. male or female above 30 years and chest of undetermined etiology was included in the study. Patients proceeded for angioplasty were also excluded from the study.

Exclusion Criteria:

Renal failure, patient not willing for procedure, asymptomatic patient or hemodynamically unstable patient, patients on inotropic support, decompensated heart failure were excluded from the study.

Statistical Analysis:

Data collected, was analyzed on SPSS version 23 for mean standard deviation for age height weight, BMI, X-ray time, contrast quantity and DAP. Independent sample T test was used to compare the level between radial and femoral procedures. Count and percentages were reported for gender, use of nitro, heparin, coronary catheters used, coronary angiography results, DM, HTN, CKD and complications. Pearson Chi square test was to see the association of these parameter with femoral and radial procedure. Binary logistic regression analysis was done to estimate the odd ratio with 95% confidence interval for complication predictors in femoral and radial angiography. P values less than 0.05 were considered statistically significant

RESULT:

The demographic and procedure related variable are summarized in table 1. Total 1111 procedures were done during the study period. Femoral route was used in 517 (46.53%) patients and radial route in 594 (53.46%) patients. Mean age in the femoral route was 55.62 ± 10.28 years and in radial route was 54.31 ± 10.08 years. Male patient in the study were 341(66.0%) for radial and 341(57.4%) for femoral route. Female in the femoral route were 176(34.0%) and 253(42.6%) for radial route. BMI of patient in the femoral route was 26.81 ± 4.13 kg/m² while in the radial route was 27.55 ± 4.67 kg/m² ($p < 0.01$).

X-ray time in femoral route was 2.81 ± 2.87 minutes while in radial route about 3.36 ± 2.65 minutes ($p < 0.01$). Mean radiation time was 356.89 ± 271.16 in femoral route vs 492.09 ± 361 ($p < 0.01$). Mean DAP was 2776.54 ± 2441.65 in femoral angiography vs 3594.50 ± 2368.52 ($p < 0.01$). Mean body mass index was 26.81 ± 4.13 vs 27.55 ± 4.67 in radial angiography ($p < 0.01$). Mean x-ray time was 2.81 ± 2.87 in femoral angiography vs 3.36 ± 2.65 in radial angiography ($p < 0.01$). Mean contrast was 52.32 ± 15.94 . Mean angiography radiation time was 356.89 ± 271.16 in femoral vs 492.09 ± 361.13 in radial angiography ($p < 0.01$). Mean DAP was 2776.54 ± 2441.65 in femoral angiography vs 3594.50 ± 2368.52 in radial angiography ($p < 0.01$). There were significant differences observed between radial and femoral procedure for all these parameters except weight.

Table 2 shows that more male 341(66%) ($P<0.01$) had angiography through femoral artery. Heparin was used in 18 (3.5%) cases in the femoral route and 587 (98.8%) in radial route. In femoral angiography was done in 511(98.8%) with left and right judkin catheters. Angiography through radial artery was done with tig catheter in 584(98.3%). Normal angiogram was 87(16.8%) in femoral as compared to 109(18.4%) in radial approach. Significant left main stem disease was 3(0.6%) in femoral access route as compared to 2(0.3%). TVD was found in 201(38.9%) patients, as compare to 230(38.7%) in radial procedure. DVD was found in 124(24.0%) as compared to 230(38.7%). All these gives significant association with type of procedure used ($p < 0.03$) obtained using Pearson Chi Square test. Patient who received nitro and heparin were those who crossed from radial to femoral route due to severe tortuosity of vessel or difficult engagement of coronaries ostia. 2 cases were abundant in the femoral route due to dissection in iliac arteries while there was no such case in the radial route.

Table 3 shows. In femoral procedure 146(28.2%) were diabetic, as compare to 162(27.3) ($p=0.71$) to radial route. ($p=0.71$). 251(48.5%) were hypertensive in femoral route as compare to 269(45.3%)($p=0.27$) in radial route. CKD was 21(4.1%) in femoral angiography as compare to 54(9.1%) ($p < 0.01$). Among radial procedure cases 27.3% were diabetic, 45.3% were hypertensive, 9.1% was having CKD. complication like radial artery spasm was noted in 16(2.7%). Pain of mild to moderate intensity at the site of insertion was 9(1.7%) in femoral access site as compare to 16(2.7%) in radial route. local hematoma was 3(0.6%) in femoral vs 3(0.5%) was observed in radial approach. Iliac artery perforation was observed in 1(0.2%) and manage successfully medically. Brachial artery perforation also seen in 1 (0.2%) and managed medically. Perinephric hematoma was

observed in 1(0.2%) patient. and successfully managed by surgical exploration in femoral angiography. Iliac artery dissection was seen in 2(0.4%) patients in femoral angiography group as compare to 2(0.3%) patients in radial artery. Cardiac arrest was not observed at all in femoral angiography while it was noted in 2(0.3%) in radial angiography. All patient was successfully DC cardioverted. Overall the rate of complication was not significantly high among the two procedure ($p=0.37$). Complication association observed a spasm almost always subsided with intra-arterial nitroglycerine and pain remained bearable during the procedure. Overall abnormal coronary arterial anomaly was seen in 47(9.0%) in femoral angio group as compared to 61(10.6%) in radial angiography group. More patient had tortuous subclavian artery 54(9.1%) vs 39(7.5%) iliac artery tortuosity. Right sided aortic arch was seen only in 1 patient in femoral angiography group. Abnormal origin of coronary arteries was seen in 7(1.4%) in femoral angio. vs 3(0.5%) in radial angio group. Radial artery loop was seen in 4(0.7%) patients. Overall there was significant difference observed for arterial anomaly in femoral vs radial group ($p=0.10$). Patient mobilization and discharged was done on the same day in radial angiography 561(94.4%) as compare to 350(67.7%) ($p<0.01$). Mobilization was at the end of procedure in radial approach but for femoral approach the time period was from 6-12 hour.($p<0.01$)

Table-4 reports the odds and 95% confidence interval for predicted complication parameters in femoral and radial angiography. Results showed aged patients gives positive association with femoral procedure, for complication. Female gender and BMI are less likely to found with femoral procedure, give negative association with femoral procedure as compare to radial procedure for complication. CKD patients found less likely to be have complication via femoral route.

DEMOGRAPHIC CHARACTERISTIC OF PTIENTS

<i>PARAMETERS</i>	<i>FEMORAL</i>	<i>RADIAL</i>	<i>P-VALUE</i>
Total Patients	517	594	
Age	55.62±10.28	54.31±10.08	0.034
Male	341(66.0%)	341(57.4%)	
Female	176(34.0%)	253(42.6%)	
Height	163.89±8.82	162.51±9.02	0.01
Weight	71.72±11.45	72.75±11.94	
BMI	26.81±4.13	27.55±4.67	
Diabetes	146(28.2)	162(27.3%)	0.71
Hypertension	251(48.5%)	269(45.3)	
CKD	21(4.1%)	54(9.1%)	

BMI= body mass index, CKD= chronic renal disease

TOOLS AND GADGETS USED IN ANGIOGRAPHY

<i>PARAMETERS</i>	<i>FEMORAL</i>	<i>RADIAL</i>	<i>P-VALUE</i>
X Ray Time IN (Minutes)	2.81±2.87	3.36±2.65	<0.01
Total Radiation time	356.89±271.16	492.09±361.13	<0.01
DAP			
Contrast	47.54±16.69	52.32±15.94	<0.01
Nitro Used	18(3.5%)	587(98.8%)	<0.01
Heparin	18(3.5%)	587(98.8%)	<0.01
Catheter (Apart from Routine)	2(0.386%)	10(1.6%)	<0.01

RDD = Radiation Dose Deliver, DAP = Dose Area Product

COMPLICATION DURING ANGIOGRAPHY

<i>PARAMETERS</i>	<i>FEMORAL</i>	<i>RADIAL</i>	<i>P-VALUE</i>
Pain	5(1%)	20%	3.4
Spasm	0	18(3.0%)	
Local hematoma	4(0.8%)	1(0.2%)	<0.01
Perforation	1(0.2%)	1(0.2)	
Vasovagal reaction	4(0.8%)	1(0.2%)	0.01
Cardiac arrest	1(0.2)	1(0.2%)	
Iliac artery dissection	1(0.2)	0	
Perinephreic hematoma	1(0.2)	0	

Table1: Mean Comparison of Age, Height and Other Quantitative Parameters

Parameters	Femoral=517 M(SD)	Radial=594 M(SD)	p-value
Age	55.62(10.28)	54.31(10.08)	0.034*
height (cm)	163.89(8.82)	162.51(9.02)	0.01*
weight (kg)	71.72(11.45)	72.75(11.94)	0.15
body mass index kg/m ²	26.81(4.13)	27.55(4.67)	<0.01*
X-ray Time	2.81(2.87)	3.36(2.65)	<0.01*
Contrast	47.54(16.69)	52.32(15.94)	<0.01*
Angio Radiation Time	356.89(27.16)	492.09(361.13)	<0.01*
DAP	2776.5(2441)	3594.5(2368)	<0.01*

Table 2: Association of Femoral and Radial with Studied Parameters (n=1111)

Characteristics		Procedure				p-value
		Femoral (n=517)		Radial (n=594)		
		n	%	n	%	
Diabetes Mellitus	Yes	146	28.2	162	27.3	0.71
	No	371	71.8	432	72.7	
Hypertension	Yes	251	48.5	269	45.3	0.27
	No	266	51.5	325	54.7	
CKD	Yes	21	4.1	54	9.1	<0.01*
	No	496	95.9	540	90.9	
Complication		21	6.3	41	7.4	
	Pain	9	1.7	16	2.7	0.37
	Spasm	0	0	16	2.7	
	Local hematoma	3	0.6	3	0.5	
	Perforation	1	0.2	1	0.2	
	Perinephric hematoma	1	0.2	0	0.0	
	Vasovagal reaction	4	0.8	1	0.2	
	Cardiac arrest	0	0.0	2	0.3	
	Iliac/radial dissection	2	0.4	2	0.3	
Arterial Anomaly		47	9.0	61	10.6	
	Tortuous subclavian/iliac	39	7.5	54	9.1	0.10
	Right side aortic arch	1	0.2	0	0.0	
	Abnormal origin of coronary vessels	7	1.4	3	0.5	
	Radial loop	0	0.0	4	0.7	

*p-value <0.05 considered significant using Pearson Chi Square test

Table 3: Association of Femoral and Radial with Diabetes Mellitus, Hypertension and other studied factors (n=1111)

Characteristics		Procedure				p-value
		Femoral (n=517)		Radial (n=594)		
		n	%	n	%	
Gender	Male	341	66.0	341	57.4	<0.01*
	Female	176	34.0	253	42.6	
Use of Nitro	Yes	18	3.5	587	98.8	<0.01*
	No	499	96.5	7	1.2	
Use of Heparin	Yes	18	3.5	587	98.8	<0.01*
	No	499	96.5	7	1.2	
Coronary catheter	tig2	0	0.0	584	98.3	<0.01*
	lt and rt judkins	511	98.8	3	0.5	
	Amplatz	0	0.0	0	0.0	
	tig/rtjud3.5	0	0.0	5	0.8	
	Jl 5,rtj4	4	0.8	1	0.2	
	amplatz1/rt judkin3.5	2	0.4	1	0.2	
Angio result	SVD	90	17.4	99	16.7	0.03*
	DVD	124	24.0	131	22.1	
	TVD	201	38.9	230	38.7	
	Normal	87	16.8	109	18.4	
	LMS	3	0.6	2	0.3	
	LMS with other vessels	9	1.7	7	1.2	
	Minimal cad	1	0.2	16	2.7	
	Abounded	2	0.4	0	0.0	

*p-value <0.05 considered significant using Pearson Chi Square test

Table 4: Complication Predictors in Femoral and Radial Angiography using Binary Logistic Regression

Variable	Odds Ratio	95% C.I for OR	p-value
Age	1.01	(1.0 - 1.02)	0.03*
Female	0.69	(0.54 – 0.88)	<0.01*
Body Mass Index	0.96	(0.93 – 0.99)	<0.01*
Diabetes Mellitus	1.04	(0.80 – 1.36)	0.71
Hypertension	1.14	(0.90 – 1.44)	0.27
CKD	0.42	(0.25 – 0.71)	<0.01*
X-ray time	0.92	(0.87 – 0.97)	<0.01*
Contrast	0.98	(0.97 – 0.98)	<0.01*
Complications	1.05	(0.66 – 1.73)	0.79
Radiation Angio	0.99	(0.98 – 0.99)	<0.01*

*p<0.05 was considered significant for odds ratio

Association with Discharged cases:

Discharged	Procedure				p-value
	Femoral		Radial		
	n	%	n	%	
Not Discharge	62	12.0	28	4.7	<0.01*
same day	350	67.7	561	94.4	
next day	105	20.3	5	0.8	

DISCUSSION:

Angiography is a mile stone procedure in the management of cardiovascular diseases.¹ But when a procedure is intended, risk is invited.² The risk of angiography starts from needle prick till the discharge of the patient on 2nd or 3rd day.

The needle prick related complication is bleeding, laceration of vessel, perforation, dissection of vessel, prick at more proximal site or more distal in femoral approach where pressure cannot be applied properly leads to hematoma and arteriovenous fistula.¹⁴ These complications lead from mild morbidity to a life threatening complications. Some of these complications are very much related to femoral artery and are best avoided in radial artery approach^{9,10,11}. However radial artery also bears its own caveat and hazards.^{12,13}

Our study included stable ischemic heart disease patients and complications related to different approaches were seen in them. We found no gross difference in the efficacy and safety profile of both radial and femoral approach. But one of the study found groin hematoma rate of 3.2% ($P = 0.011$).⁹

We found femoral approach more convenient for operator except in very obese patients where femoral artery palpation difficult most of the time. However radial approach was most popular among patients particularly of female gender. The main hindrance for femoral approach among the patient was restriction of patient's movement and modesty of patients particularly in female.

Nonetheless, the main deterrence, in radial approach was very weak pulse, impalpable pulse, tortuous vessel and anomalous vessel of the upper limb. Patient with dilated aortic route were prone to coronary engagement failure most of the time.

One of the study found that some patients exhibited symptoms in the left lower extremity that included swelling, pain (58.33%), pigmentation (54.17%) and

ulcers (33.33%). While no such complication was observed in our study¹⁰

In our observation, obese patients with femoral approach were at risk of puncture site hematoma particularly in patients, whose procedure was performed by operators with inadequate experience. Hematoma was also noted in very distal puncture while very proximal approach exposed the patient to iliac vessel bleeding and hematoma. Same was found in study by Ingaki et al. that showed hematoma more pronounced in obese patients and femoral approach⁹. The present study has similar complication rate 45(8.8%) in femoral access route as compare to reported from the literature as 0-17% diagnostic and cardiovascular procedure.² Chandrasekar et al reported femoral artery related complication 1.8%.⁴ Tsetis et al reported significant hematoma or uncontroable bleeding requiring transfusion or invasive procedure occurred in < 1%.¹⁵ while in our study hematoma rate was 0.6%. In our series we did not come across any retroperitoneal heamorrhage while Yakskar reported from 2-12%¹⁶. One patient had perinephric hematoma due to angio wire went to right renal artery and catheter was advance over the wire without use of fluroscopy leading to pain and shock and surgically opened and patient survived. Arterial dissection reported in literature as 0.01-0.4% while we had 2(0.4%) in our study.⁹ Sherev et al found that 7% of all vascular site complication were due to lower or high femoral artery puncture site.²

Patient who underwent radial approach has been shown to significantly reduce bleeding complication. The PRESTO ACS study revealed that radial access site was associated with significantly decrease in bleeding a non significant decrease in net clinical outcome during hospitalization compared to femoral access.³⁰ In the present study we observed fluoroscopy time, radiation time and DAP and contrast amount used was significantly more in radial access. The reason being that patients accessed through radial approach had more more female population, radial artery spasm, tortous subclavian and more radial loops, observed which took more time to engage the

catheter and more contrast radiation and fluoroscopy time. The REVIVAL trial has also reported longer fluoroscopy time. Hematoma and pseudoaneurysm requiring closure occurred more frequently with femoral access. Similar finding observed in our study. **31** The Blockage of radial artery at different level and radial vessel anomaly was the common limitation in the radial artery approach for angiography. Radial artery dissection was also noted in radial approach. Similar results were also found in a study by Elton Sovdan that showed more spasm in radial specially shifting procedure to brachial approach.²⁴

Some operators are more comfortable with femoral route^{15, 16} in acute coronary syndrome particularly in patients who are suffering from shock after acute myocardial infarction¹⁷. While other operators, argue for radial artery approach in these patients^{18, 19, 20}. Mostly the success, safety and efficacy of any approach are on the cuff of the operator expertise.²¹

The rate of complication with most operators were the same in both femoral and radial routes.^{22,23} We observed the same rate of complication in both approaches in our study with somewhat minor differences like radial artery pain and radial artery spasm with radial approach and hematoma in femoral approach. Similarly, radiation ratio was more in radial vs. femoral route. Net amount of contrast used in radial approach was more and remain statistically significant which very much same as study by Guillaume Plourde.²⁵ Similarly, the number of patients with chronic renal disease (CKD) is significantly high in the radial artery approach group but no significant complication noted in the study. However, the difference of major complication in both procedures remains insignificant. Radial access has been associated with lower rates of complication <0.7% more patients satisfaction and comfort reduce hospital **6,24**. in our study complication rate was higher because procedure was done by trainee to senior consultant which is a real world scenario. It take learning curve phase to overcome pitfalls in mastering radial access angiography.

CONCLUSION:

We found no major difference between radial and femoral approach to angiography. About 8% patient needed Multiple catheters during the procedure in radial approach which lead to prolong procedure time and use of increased amount of contrast. We observed more cases with CKD in radial group but despite these differences, no significant effect was noted on the overall patient recovery and hospital stay. There was some minor complication with both type of procedures

which were successfully tackled at procedure table site.

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