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CARDIAC CATHETERIZATION LAB PROCEDURES: SAFE JOURNEY IN SAFE HANDS

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Contribution
SB did literature review and research design. UA finalized the manuscript. IK, MK, HA helped in data collection, analysis in the final draft. All authors contributed significantly to the submitted manuscript.

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ABSTRACT

Objectives: To find out the immediate complications of different procedures performed routinely in cardiac catheterization Lab.

Methodology: This cross sectional study was performed in Cardiology Unit of Lady Reading Hospital Peshawar, from 1st January 2015 to 31st December 2015. Patients of either gender were included in the study. Different procedures like coronary angiography, percutaneous coronary intervention and PTMC were performed during the period of the study. All the procedures were done by a single operator after informed consent. Patients less than 20 years were excluded from the study. Complication developed during 24 hr or immediately after or during the procedure were noted. All the data was analyzed on SPSS version 16.

Results: This study included 259 patients presented to Cardiology Unit for different cardiac cath procedures. Of them 174 (67.2%) were males. Mean age was 53.06 ± 12.7 years. In these patients coronary angiography was performed in 113 (43.6%) patients, PCI in 120 (46.3%), PTMC in 25(9.7%) and pulmonary angiography in 1 (0.4%) patient. Immediate complications were recorded in 9 (3.6%) while no complication was found in 250 (96.5%) of the procedures performed. Complications like expiry, failure to cross the lesion, failure to deploy stent, ventricular fibrillation, femoral artery dissection, stent damage, and cardiac temponade was found in only a single case each, making about 0.4% each with p value of 0.9.

Conclusion: Complications of different procedures performed in Cardiac catheterization Lab of a tertiary care hospital are safe provided performed in experienced hands.

Key Words: Coronary Angiography, PCI, PTMC, Cardiac Temponade, Femoral Artery Dissection

INTRODUCTION

Cardiovascular diseases (CVD) and acute myocardial infarction (AMI) are the leading cause of morbidity and mortality worldwide, responsible for about 17.5 million deaths per year.[1] The main factor for the prognosis of MI patients who survive the episode, is the amount of myocardium that undergoes irreversible injury, that is infarct size.[2] Early reperfusion is the best strategy to reduce infarct size in AMI patients. However, reperfusion injury can lead to an additional damage.[3] A cardiac catheterization is the first step to identify the extent of diseased coronary vessel in AMI and for further planning of a percutaneous coronary intervention (PCI). This invasive and risky procedure can result in complications like aortic dissection, aneurysm, arrhythmia, etc.[4] These complications, although uncommon but still occur during coronary angiography and can prove to be life-threatening in some instances.[5]

Complications can be related to approach as well as the procedure itself. Several approaches are used for the cardiac catheterization procedure that include femoral as well as radial approach. These different approaches have their own complications. Most of the literature review showed that Femoral artery access (TFA) is a standard approach for invasive coronary procedures. However, trans radial access (TRA) has become a good alternate, offering a significant decrease in access site complications (mainly local bleedings) as well as short hospital stay.[6,7] With radial approach even reduced mortality among ST segment elevation myocardial infarction (STEMI) patients has been reported.[7] European Society of Cardiology (ESC) STEMI guidelines recommend radial approach as class IIa if it is performed by an experienced operator.[8]

Of different procedure related complications, iatrogenic coronary artery dissection with or without rupture is a rare but feared complication of coronary angiography. Catheter insertion may induce left main artery dissection with a reported incidence rate of less than 0.1% with devastating consequences. Immediate treatment with both emergency coronary artery bypass graft surgery (CABG) and use of covered stents reported effective in treatment for the Left main artery dissection.[5]

The aim of this study was to find out the immediate complications during different procedures of cardiac catheterization and their immediate consequences.

METHODOLOGY

This cross sectional study was performed from 1st January 2015 to 31st December 2015 in cardiac catheterization lab (cath lab) of Cardiology Unit of Lady Reading Hospital Peshawar. Lady Reading Hospital is a tertiary care hospital and receives patients from all over the Khyber Pakhtunkhwa for the sole purpose of treatment of cardiac ailments. We perform almost all types of cardiac procedures including coronary angiographies, percutaneous coronary intervention (PCI), perctaneous transmural commissurotomy (PTMC) and permanent pacemaker insertion etc in cardiac catheterization lab.

Patients of either gender were included in the study. Different procedures like coronary angiography, percutaneous coronary intervention and PTMC were performed during the period of the study . All the procedures were done by a single operator to remove operator related complications. Informed consent was taken from all the patients before the procedure. Data was properly collected and maintained in cath lab register including patient contact information.

All patients fulfilling the inclusion criteria were involved in the study. Procedures performed on patients less than 20 years were excluded from the study. Immediate complication was defined as the complication developed during 24 hr or immediately after or during the procedure. Complications like coronary artery dissection, catheter induced spasm, arterial perforation, cardiac temponade, approach related complications like hemotoma development, arrhythmias and cardiac arrest were recorded.

Presenting complaints and clinical features of the patients included in the study were also noted. All the data was analyzed on SPSS version 16 for windows. Mean and SD was used for variables like age and gender.

RESULTS

This study included 259 patients of either gender presented to cardiology unit for different cardiac cath procedures. Of them 174 (67.2%) were males while 85 (32.8%) were females. Mean age was 53.06 ± 12.7 years as shown in table 1. All of the patients were subjected to cardiac catherterization and other different procedures. Patients presented with different cardiac disease including ST elevation myocardial infarction 73 (28.2%), Non ST elevation myocardial infarction 32 (12.4%), Unstable Angina 32 (12.4%), Stable Angina 77 (29.7%), post PCI 17 (6.6%), post Bypass graft surgery (CABG) 3 (1.2%), and Rhematic Heart Disease 25(9.7%) as shown in table 2. In these patients coronary angiography was performed in 113 (43.6%) patients, PCI in 120 (46.3%) , PTMC in 25(9.7%) and pulmonary angiography in 1 (0.4%) patient (Table 3).

Table 1 : Gender Distribution of Study Population

Gender	Number n (%)
Male	174 (67.2%)
Female	85 (32.8%)
Age (years) Mean ± SD	53.06 ± 12.7

Table 2 : Presenting Disease Pattern in Study Population

Presentation	Frequency (n)	Percentage (%)
STEMI	73	28.2
NSTEMI	32	12.4
Stable Angina	77	29.7
Unstable Angina	32	12.4
Post PCI	17	6.6
Post CABG	3	1.2
Palpitations	25	9.7
Total	259	100.0

Immediate complications were recorded in 9 (3.6%) while no complication was found in 250 (96.5%) of the procedures performed. Complications like expiry, failure to cross the lesion, failure to deploy stent ,ventricular fibrillation , femoral artery dissection, stent damage, and temponade was found in only a single case each , making about 0.4% each (Table 4). No significant relationship was found between procedure and related complications (p=0.99) as shown in table 5.

DISCUSSION

Coronary angiography is the main stay procedure for determining the lesion burden and making further plan regarding percutaneous coronary interventions like stent placement. Also help to evaluate hemodyamics of different cardiac related situations. No doubt it is gold standard for cardiac diagnosis but it is related with number of complications. Of them iatrogenic coronary artery dissection is the most feared complication of all. Literature review reports very few less than 0.1% of theses complications and cases have been reported but here in our study we didn't notice a single case.[5]

Life threatening complications, although uncommon but still occur during coronary angiography. Catheter-induced dissection of a coronary artery is a rare but well-recognized

Table 3 : Frequency of Procedures Performed on Study Population

Procedure	Frequency (n)	Percentage (%)
Cor. Angio	113	43.6
PTMC	25	9.7
PCI	120	46.3
Pul. Angio	1	0.4
Total	259	100

Pul. Angio : pulmonary angiography, Cor Angio : coronary angiography

Table 4: Frequency of Complications Related to Procedure

Complications	Frequency (n)	Percentage (%)
Expiry	1	.4
Failed procedure	1	.4
Failure to cross	1	.4
Failure to deploy	1	.4
Femoral Artery Dissection	1	.4
None	250	96.5
Stent Damage	1	.4
Syncope	1	.4
Temponade	1	.4
Ventricular fib	1	.4
Total	259	100.0

complication of coronary angiography with a high mortality rate if left untreated.[3,9] Vigorous hand-injection of contrast medium, subintimal passage of the guide-wire, or inappropriate handling of the guide-wire catheter has been found as a cause of dissection.[10] Mechanical straining and shearing forces during coronary angiography result in increased wall stress in most of the instances.[3] It is a feared complication and has been found in literature but there was no such complication in our study population.[5]

Rough catheter manipulation, type of catheter used (e.g. Amplatz catheter and small Judkins catheter resulting in deep LMCA intubation), use of stiffer guide-wires, unfavorable anatomy, operator's experience, and presence of the LMCA atherosclerosis have all been associated with an increased risk of dissection.[11] Awadalla et al. reported less than 0.1% incidence of iatrogenic LMCA dissection.[1] Eshtehardi et al. stated 0.07% overall incidence of iatrogenic

Table 5 : Relation Between Procedures Performed and Complications

Complications	PROCEDURES (n)				P value
	Cor angio	PCI	PTMC	Pul angio	
Expiry	0	1	0	0	0.99
Failure to cross	0	1	0	0	
Failure to deploy	0	1	0	0	
FA dissection	1	0	0	0	
None	111	113	25	1	
Stent damage	0	1	0	0	
Syncope	1	0	0	0	
Temponade	0	1	0	0	
VF	0	1	0	0	

LMCA dissection during their study period mostly during PCI than coronary angiography.[12,13] However there was no such complication in our study population.

Puncture site complication is another issue encountered during cardiac cath procedures. One of the the meta-analysis showed that the percentage of puncture site complications in the radial group was 4.1% and about 15.5 % in femoral group as well as in large-scale clinical trial RIVAL.[14] In our study rate was 0.4%. The difference might be due to small population size as well as 1 year duration which small as compare to RIVAL trial.

Similarly iatrogenic dissection of a coronary artery during a percutaneous procedure can be triggered by many factors, including atherosclerosis of the artery, difficulty catheter engagement, vigorous contrast injection, inexperienced operator, and inappropriate catheter position or sub-intimal passage of the guidewire.[15] We found difficulty in passing guide wire and crossing in only 0.4% of the procedures, however no dissection of coronary artery was found even during PCI. Although prompt reperfusion therapy is recommended for ST-elevation myocardial infarction (STEMI) patients.[16] However in some cases of STEMI who have normal coronary arteries, coronary spasm (CAS) plays an important role.[17]

Coronary spasm is a rare complication that needs vasodilator drugs in some circumstances although simple withdrawal of catheter helps with it.[18] This rare complication although noted in some cases was not that significant. Our study found no significant relation between procedure and related complications, thus proving that most of the procedures are safe provided done in experienced hand. The results of our study are quiet similar to other studies providing safety of different procedures in our set up as well.

LIMITATIONS

Main aim of the study was to look for immediate complications of different procedures performed at our unit. Although our study did not showed significant complications during or immediately after procedures our study has some limitations. This was performed at a single center and by a single operator, so can not be generalized for complications overall. Moreover study duration and sample size was not adequate so more extensive study is needed.

CONCLUSION

Complications are rare but different procedures performed in Cardiac catheterization Lab of a tertiary care hospital are safe provided performed in experienced hands.

REFERENCES

1. World Health Organization. Cardiovascular diseases (CVDs). Geneva: WHO; 2016.
2. Burns RJ, Gibbons RJ, Yi Q, Roberts RS, Miller TD, Schaer GL, et al. The relationships of left ventricular ejection fraction, end-systolic volume index and infarct size to six-month mortality after hospital discharge following myocardial infarction treated by thrombolysis. J Am Coll Cardiol 2002;39(1):30-6.
3. Heusch G. Reduction of infarct size by ischaemic post-conditioning in humans: fact or fiction? Eur Heart J 2012;33:13-5.
4. Baars T, Neumann U, Jinawy M, Hendricks J, Sowa JP, Kälsch J, et al. In acute myocardial infarction liver parameters are associated with stenosis diameter. Medicine (Baltimore) 2016;95(6):2807.
5. Tarbiat M, Safarpoor G. Emergency coronary artery bypass graft surgery for iatrogenic left main coronary artery dissection. J Tehran Heart Cent 2015;10(4):215-8.
6. Louvard Y, Lefèvre T, Allain A, Morice M. Coronary angiography through the radial or the femoral approach: the CARAFE study. Catheter Cardiovasc Interv 2001;52:181-7.
7. Pristipino C, Trani C, Nazarro MS, Berni A, Patti G, Patrizi R, et al. Major improvement of percutaneous cardiovascular procedure outcomes with radial artery catheterization: results from the PREVAIL study. Heart 2009;95:476-82.
8. Rutka JK, Bryniarski K, Tokarek T, Dębski G, Krawczyk A, abówka A, et al. Comparison of patient comfort after coronary angiography by standard arterial access approaches. Kardiol Pol 2016;74(1):68-74.
9. Levine GN, Bates ER, Blankenship JC, Bailey SR, Bittl JA, Cercek B, et al. 2011 ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines and the Society for Cardiovascular Angiography and Interventions. Circulation 2011;124:574-651.
10. Marchesini G, Brizi M, Bianchi G, Tomassetti S, Bugianesi E, Lenzi M, et al. Nonalcoholic fatty liver disease: a feature of the metabolic syndrome. Diabetes 2001;50:1844-50.
11. Targher G, Arcaro G. Non-alcoholic fatty liver disease and increased risk of cardiovascular disease. Atherosclerosis 2007;191:235-40.
12. Awadalla H, Sabet S, El Sebaie A, Rosales O, Smalling R. Catheter-induced left main dissection incidence, predisposition and therapeutic strategies experience from two sides of the hemisphere. J Invasive Cardiol 2005;17(4):233-6.

13. Nageh T, Badawi R, Thomas MR. Left main coronary artery dissection detected by intravascular ultrasound following angiographically successful percutaneous coronary intervention. J Invasive Cardiol 2004;16(5):279-80.

14. Liu P, Gao XL, Li BF, Ding XZ, Wang ZH, Dang YP, et al. Radial versus femoral artery access for percutaneous coronary angiography and intervention: a systematic review and meta-analysis of randomized controlled trials in Chinese population. Int J Clin Exp Med 2015;8(10):17151-66.

15. Zwoliński R, Marcinkiewicz A, Jaszewski R, Szymczyk K, Pietruszyński R. Iatrogenic left main-stem dissection extending to the circumflex artery and retrogradely involving the left and non-coronary sinuses of Valsalva: iatrogenic aortocoronary dissection. Cardiovasc J Afr 2015;26(6):5-7.

16. O'Gara PT, Kushner FG, Ascheim DD, Casey DE Jr, Chung MK, de Lemos JA, et al. American College of Emergency Physicians; Society for Cardiovascular Angiography and Interventions, 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2013;61:78-140.

17. Ong P, Athanasiadis A, Hill S, Vogelsberg H, Voehringer M, Sechtem U. Coronary artery spasm as a frequent cause of acute coronary syndrome: The CASPAR (Coronary Artery Spasm in Patients With Acute Coronary Syndrome) study. J Am Coll Cardiol 2008;52:523-7.

18. Keskin K, Şahin A, Y Idz SS, Aksan G. Resistant spontaneous coronary artery spasm. Turk Kardiyol Dern Ars 2015;43(7):637-9.