International Journal of Science and Healthcare Research
Vol.4; Issue: 2; April-June 2019
Website: www.ijshr.com
Original Research Article *ISSN: 2455-7587*

Post-Coronary Angiography Vascular Complications in Acute Coronary Syndrome Patients

Bashaer Basunaid[1,3], Shahad Alaydarous[1,3], Amal Taha[1,3], Abdulrhman Norah[1,3] ,Issam Altnji[2,3] , Mohammed A. Qutub[2,3].

[1]Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia, House Officer
[2]Department of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia. , Assistant professor
[3]King Abdulaziz University Hospital, Jeddah, Saudi Arabia.

Corresponding Author: Mohammed A. Qutub

ABSTRACT

Objectives: To determine the prevalence of vascular complications and major adverse cardiovascular after effects in acute coronary syndrome patients who had coronary angiography at King Abdulaziz University Hospital.
Methods: Using a prospectively collected registry from January 2016 to December 2017, we analyzed the prevalence of vascular complications in 1053acute coronary syndrome patients who had coronary angiography. Patients were allocated into 2categoriesbased on the presence or absence of vascular complications.
Results: Amongst acute coronary syndrome patients who had coronary angiography, we identified 39 (3.7%) patients who had at least 1 vascular complication. The mean age of patients was 55.5±10.2 years and the patients were mostly male (87.20%). The identified vascular complications included bleeding (5 patients had major bleeding and 34 had minor bleeding), access site hematoma (27 patients), and pseudo-aneurysm (2 patients). Lesser post-procedural bleeding was observed in the trans-radial than in the femoral approach (1.4 versus 4.3%, p=0.025). Similar mortality was noted on 1-month follow-up in both groups (0 versus 0.3%, p=0.44). The occurrence of myocardial infarction and repeat catheterization was also close in both groups (0 versus 0.4%, p=0.45 and 0 versus 2%, p=0.4, respectively). Readmission with congestive heart failure was higher in patients who developed vascular complications (5.1% versus 0.8%, p=0.003).
Conclusion: Vascular complications are relatively uncommon in acute coronary syndrome patients having coronary angiography. Fewer complications were associated with the trans-radial approach in contrast to the trans-femoral approach. Patients who developed vascular complications showed increased readmission rates due to heart failure.

Keywords: coronary artery disease, cardiac catheterization, cardiovascular diseases, acute coronary syndrome, vascular complications, percutaneous coronary intervention

Abbreviation list

ACS: acute coronary syndrome
KAUH: King Abdulaziz University Hospital
STEMI: ST-segment elevation myocardial infarction
NSTEMI: non-ST-segment elevation myocardial infarction
PCI: percutaneous coronary intervention
CABG: coronary artery bypass graft
TIMI: Thrombolysis in Myocardial Infarction
BMI: body mass index

INTRODUCTION

Around 17 million people die worldwide due to cardiovascular diseases in 2008,and 50% of deaths are due to acute coronary syndrome (ACS).[1] ACS is common in Saudi Arabia; a study conducted between 2005-2007 showed that 2031 patients were diagnosed with ACS.[2] Another study conducted in Riyadh showed that 19.6% of patients who came with chest pain to the emergency department were diagnosed with ACS.[3] In the United Kingdom, admissions due to ACS recorded

in the national registry show 61%of cases are caused by STEMI and 39%by NSTEMI.[4]

Treatment of ACS is classified into medical treatment and interventional revascularization via coronary angiography.[1] The most accurate procedure for detection and treatment of coronary heart diseases is coronary angiography. Like any invasive procedure, it has some risks such as access-site associated complications (hematoma; bleeding; pseudoaneurysm, which is defined as accumulation of blood between the media and adventitia;[5] retroperitoneal hemorrhage;[6] arterial thrombosis or distal embolization; arteriovenous fistula; cerebrovascular complications; contrast-induced nephropathy; and infection).[5]

The most frequent complications following coronary angiography are vascular complications

Vascular complications are considered among the most common following coronary angiography and are considered to be predictors of morbidity and mortality following the procedure, especially when accompanied by major bleeding.[5] Moreover, patients who had an elective PCI had lower occurrences of vascular complications than patients with ACS.[7] The negative prognostic effect of bleeding on patients with ACS was studied by a meta-analysis revealing that it is the independent predictor of mortality.[8]

A CS is a common disease with a high mortality rate, especially if bleeding occurs after cardiac catheterization. It is, therefore, important to estimate the incidence and predictors of vascular complications. In ACS patients who had coronary angiography at King Abdulaziz University Hospital (KAUH), we wanted to determine number of transfused blood units, development of hematoma, and pseudoaneurysm. Laboratory investigations were also performed during collection of data to evaluate lipid profile and creatinine, hemoglobin, platelet, and HbA1c levels.

Figure legends

the prevalence of vascular complications and major cardiovascular after effects.

MATERIALS AND METHODS

Patients aged 18 years and older presenting with ACS who underwent coronary angiography at KAUH from January 1, 2016 to December 31, 2017 was included in our analysis. Those patients were part of the KAUH cardiac catheterization laboratory registry and their data were collected prospectively. This study was approved by the King Abdulaziz University research ethics board and consent was taken from the patients.

By using the previously collected registry data and hospital information system, the following data were extracted for each patient: age, sex, ethnicity, cardiovascular risk factors, height, and weight. In addition, procedure-related details, including puncture site, post-procedure events, and vascular complications, were collected. Vascular complications included major and minor bleeding (determined by the TIMI score criteria; see table 1),[9]

Table 1

Major criteria
Intracranial hemorrhage. Evident signs of bleeding established by a more than or equal 15% decrease in hematocrit or decrease in hemoglobin of ≥5 g/dL. Fatalbleeding (bleeding within 7 days that lead to death).
Minor criteria
Clinically evident bleeding (including radiological imaging) which lead to a more than or equal 10% drop in hematocrit or (3 to less than 5 g/dL) decrease in hemoglobin. No evidence of blood loss with a drop in the level of hemoglobin of more than or equal 4 g/dL or ≥12% fall in hematocrit. Any obvious hemorrhage that met 1 of these criteria and does not fit the above criteria: Needs interventions (medical or surgical) to manage the bleeding. The outcomes are either hospitalization or prolong the hospitalization length. Instant evaluation (leading to evaluation either by radiological imaging or laboratory testing and unscheduled appointment to seek medical advice)

STATISTICAL METHODS

Statistical analysis was performed using the Statistical Package for Social Science 20 (SPSS Inc., Chicago, IL, USA). Data are expressed as mean +/- standard deviation (minimum - maximum) or

frequencies (percentage) as appropriate. Using Kolmogorov-Smirnov Test, the normality distribution of data was checked. The Chi-square test was used for non-continuous variables, while the unpaired Student's t-test and the Mann Whitney *U*-test were used for normally and non-normally distributed variables, respectively. A p-value <0.05 was considered as statistically significant.

RESULTS

Amongst 1053 patients who had ACS and underwent coronary angiography, we identified 39 (3.7%) patients who had at least 1 vascular complication. In table 2, the patients' baseline characteristics are shown. Despite the retrospective nature of this study, the 2 studied groups were reasonably well-matched regarding age, weight, height, BMI, gender, ethnicity, comorbidity and smoking status but the Saudi patients were more in cases with vascular complication while non Saudi were more in patients without vascular complications (P =0.35).

Table 2

	Patients with vascular complications (n=39)	Patients without vascular complications (n=1014)	P-value
Age (years)	57.46±11.05	55.52±10.24	0.24
Weight (kg)	76.92±14.54	77.40±15.14	0.87
Height (m)	1.65±0.09	1.65±0.09	0.11
BMI (kg/m^2)	27.57±5.33	28.35±5.22	0.46
Sex			0.29
Male	34 (87.20%)	834 (82.20%)	
Female	5 (12.80%)	180 (17.80%)	
Nationality			0.03
Saudi	14 (35.90%)	221 (21.80%)	
Non- Saudi	25 (64.10%)	793 (78.20%)	
Ethnicity			0.37
Arabic	23 (59.00%)	540 (53.30%)	
Indian continent	11 (28.20%)	324 (32.00%)	
African	-	13 (1.30%)	
Others	3 (7.70%)	121 (11.90%)	
Asian continent	2 (5.10%)	16 (1.60%)	
Hypertension	25 (64.10%)	593 (58.50%)	0.29
Diabetes mellitus	15 (38.50%)	445 (43.90%)	0.30
Previous PCI	10 (25.0%)	228 (22.50%)	0.38
Hyperlipidemia	7 (17.90%)	155 (15.30%)	0.39
Previous CABG	2 (5.10%)	47 (4.60%)	0.55
Smoking status			0.20
Current smoker	13 (33.30%)	270 (26.60%)	
Ex-smoker	6 (0.60%)	7 (0.70%)	
Non-smoker	25 (64.10%)	738 (72.80%)	

PCI: percutaneous coronary intervention; CABG: coronary artery bypass grafting.

Table 3

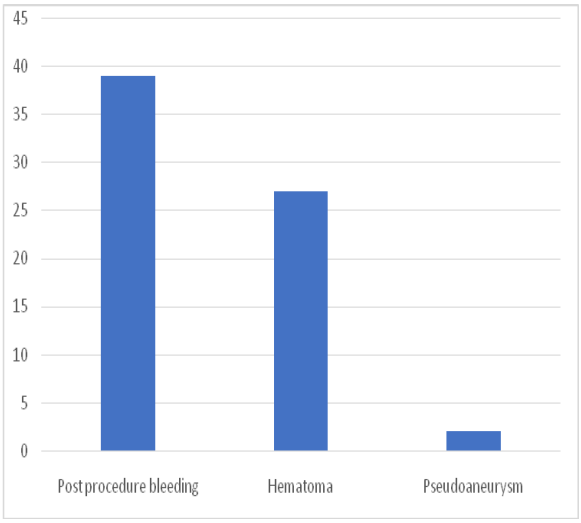
	Patients with vascular complications (n=39)	Patients without vascular complications (n=1014)	P-value
Access site			
Femoral	36 (92.30%)	800 (78.90%)	0.025
Radial	3 (7.70%)	214 (21.10%)	
Diagnosis			
Unstable Angina	12 (30.80%)	301 (29.70%)	0.50
NSTEMI	14 (35.90%)	307 (30.30%)	0.27
STEMI primary PCI	5 (12.80%)	128 (12.60%)	0.56
STEMI pharmaco-invasive PCI	6 (15.40%)	183 (18.00%)	0.43
STEMI Rescue	2 (5.10%)	36 (3.60%)	0.41
Staged PCI	-	63 (6.20%)	0.08

NSTEMI: non-ST-segment elevation myocardial infarction; STEMI: ST-segment elevation myocardial infarction; PCI: percutaneous coronary intervention

The mean age in those with vascular complications was 55.5±10.2 years, and they were mostly male (87.20%). 28.3±5.2 kg/m^2 was the mean BMI. The most commonly encountered risk factor in both groups was hypertension (table 2). The most common indication for coronary angiography in both groups was NSTEMI (35.9% in those with vascular

complications and 30.3% in patients who hadn't), followed by unstable angina (30.8% and 29.7%, respectively, table 3). There were more Saudi patients in the group of patients who developed vascular complications (35.9% versus 21.8%, p=0.03, table 2).

Figure 1. Vascular complications in the studied cohort (n=39 patients)



The vascular complications identified were bleeding (5 patients had major bleeding and 34 had minor bleeding according to the TIMI criteria), access site hematoma (27 patients), and pseudo-aneurysm (2 patients, figure 1).

Coronary angiography was done through the trans-radial approach in 217 (20.1%) patients, while the trans-femoral approach was used in 836 (81.9%) patients. The trans-radial approach had lesser post-procedural bleeding than the trans-femoral approach (1.4 vs. 4.3%, p=0.025). There were less hematomas with the trans-radial approach, but this difference did not reach statistical significance (1.4% vs. 2.9, p=0.16). Each group had only 1 patient who developed a pseudo-aneurysm (table 4).

Table 4

	Trans-radial approach (n=217)	Trans-femoral approach (n=836)	P-value
None	214 (98.60%)	800 (95.70%)	0.16
Post-procedural bleeding	3 (1.40%)	36 (4.30%)	0.025
Pseudo-aneurysm	1 (0.50%)	1 (0.10%)	0.37
Hematoma	3 (1.40%)	24 (2.90%)	0.16
Hematoma size			0.51
Small	2 (66.70%)	10 (41.70%)	
Medium	-	7 (29.20%)	
Large	1 (33.30%)	7 (29.20%)	
Retroperitoneal hemorrhage	0	0	

Laboratory investigations showed that post-catheterization showed significantly lower hemoglobin levels in patients who developed vascular complications than inpatients without vascular complications (12.2 g/dl vs. 13.4 g/dl, p=0.006). HbA1c was higher in the group without vascular complications (7.0 vs. 8.1, p=0.021, table 5).

Table 5

	Patient with vascular complications (n=39)	Patient without vascular complications (n=1014)	P-value
Cholesterol	4.67±1.42	4.78±1.76	0.73
HDL- C	1.10 ±0.57	1.03 ±0.50	0.48
LDL- C	3.01±1.09	3.15±1.18	0.53
Triglyceride	2.05±2.27	2.09±1.45	0.06
Pre-procedure HGB	14.31±2.24	14.05±2.02	0.45
Post-procedure HGB	12.27±2.91	13.37±2.14	0.006
Platelets	249.77±65.78	273.12±73.94	0.08
HbA1C	7.01±1.80	8.07±2.51	0.02
Troponin	2.89±3.34	2.21±3.07	0.23
Peak CK	655.87±1055.48	754.73±1254.73	0.45
Pre-procedure creatinine	97.85±27.20	94.15±32.45	0.51
Peak post-procedure creatinine	107.00±4.72	98.43±59.59	0.10

HDL-C: high-density lipoprotein-C; LDL; low-density lipoprotein-C; HGB: hemoglobin; CK: creatinine kinase.

Clinical follow-up at 1 month showed that mortality (0 vs. 0.3%, p=0.44), rate of myocardial infarction (0 versus 0.4%, p=0.45), and repeat catheterization (0 versus 2%, p=0.4) were similar in patients with and without complications. In patients who developed vascular complications, readmission rates were higher due to congestive heart failure. (5.1% versus 0.8%, p=0.003, Table 6).

Table 6.

Outcome	Patients with vascular complications	Patients without vascular complications	P-value
Asymptomatic	32 (82.05%)	840 (82.84%)	0.21
Death	-	3 (0.30%)	0.44
Myocardial Infarction	-	4 (0.40%)	0.44
Recurrent angina on medical treatment	2 (5.10%)	72 (7.10%)	0.40
Repeat Angiogram			
Stent thrombosis	-	20 (2.00%)	0.4
In-Stent-Restenosis	-	3 (0.30%)	0.45
Patent stent/vessel	-	13 (1.30%)	0.42
Heart failure	2 (5.10%)	8 (0.80%)	0.003

DISCUSSION

In this study, our aim was to find out the vascular complications in ACS patients who had coronary angiography. A real-world cohort of consecutive ACS patients was used in this study. Most patients presented with unstable angina or NSTEMI, but around 40% of participants presented with STEMI. Of those, there were about 15-20% who received thrombolytic therapy, which is known to have larger percentages of vascular complications such as bleeding.[10]

The incidence of vascular complications in this study was 3.7%, which is comparable to rates reported in previous studies, which ranged between 2.6% and 6.6%.[9,11-14] Vascular complications included bleeding, hematomas, and pseudo-aneurysms. A significant difference was found in vascular complications comparing the trans-femoral and trans-radial approaches. Only 1.4% patients had post-procedure bleeding through the trans-radial approach, in contrast to4.3% with the trans-femoral approach (p=0.02). The radial artery is smaller in caliber, easily compressible, and more superficial.[15] Previous studies also found that the trans-radial approach had lesser bleeding complications than the trans-femoral approach.[15, 16] This finding is similar to the results of a meta-analysis which demonstrated that trans-radial approach reduces the risk of major bleeding.[17] A meta-analysis performed by Agostoni et al. showed that the trans-radial approach reduces other access site complications, including hematoma and pseudo-aneurysm.[18] 2 large randomized clinical trials, RIVAL and MATRIX showed that the trans-radial approach has been associated with reduction of mortality in patients presenting with STEMI.[19, 20]

The most prevalent risk factors were hypertension followed by diabetes mellitus, previous PCI, hyperlipidemia, prior CABG, and smoking, with a non-significant difference between groups. While 2 previous meta-analyses showed that patients who had major bleeding after PCI are more prone to have renal failure, heart failure, hemodynamic instability, and STEMI/ NSTEMI.[21,22] Our study did not report any of those deleterious outcomes, which may be due to the short-term follow-up or small sample size. Moscucci et al. showed that a significantly higher risk of bleeding was associated with history of renal failure and prior bleeding, along with the use of pharmacological agents, such as vasodilators, GP IIb/IIIa receptor blockers, diuretics, inotropes, and thrombolytics.[23]

Looking at the laboratory results, those who had vascular complications had a significant decrease in hemoglobin after the procedure in contrast to those with no complications (2.1 g/dl versus 0.7 g/dl, p=0.006). This is expected as those patients developed peri-procedural bleeding or

access site complications. Moreover, those who had vascular complications had a significantly lower platelet count (249.7 versus 273, p=0.08). This is also expected to be associated with bleeding due to the process of platelet consumption. On the other hand, HbA1c was found to be higher in the group that did not develop vascular complications, which is likely due to a higher number of diabetics in this group; however, there was no significant difference.

Most patients were asymptomatic at the 1-month follow-up. However, readmission rates were higher in those who had heart failure. This could be explained by volume overload secondary to transfusion of blood products or anemia causing high-output failure. On the other hand, mortality was similar in both groups, which might be because of the small sample size. Manoukian et al. showed that an independent risk factor for the 30-day mortality rate in ACS patients was bleeding.[8]

The strength of this study that it studies a relatively large number of prospectively collected patients with ACS. However, clinical registries may have the inherent limitation of being collected in a single center, along with the risk of unmeasured multiple confounders.

CONCLUSION

Vascular complications are relatively uncommon in ACS patients who had coronary angiography. There were fewer complications with trans-radial approach than the trans-femoral approach. Patients who developed vascular complications showed increased readmission rates due to heart failure.

ACKNOWLEDGMENTS

We would like to thank Manal Maeed Althagafi, Raghdah Adel Delli, Alya Sameer Alharbi, and Anfal AmanUllah for their effort in collecting the data.

Conflicts Of Interest: There is no conflict of interests for the authors concerning the publication of this paper.

REFERENCES

1. Lashari D, Lakho DI, Memon DA, et al. Acute Coronary Syndrome; Frequency, contributing factors and types in patients with typical chest pain. Professional Med J2017;24:409–13.
2. AlFaleh HF, Al Shamiri MQ, Ullah A, et al. Disparities in health care delivery and hospital outcomes between non-Saudis and Saudi nationals presenting with acute coronary syndromes in Saudi Arabia. PloSOne 2015;10:e0124012.
3. Mehmood T, Al Shehrani MS, Ahmad M. Acute coronary syndrome risk prediction of rapid emergency medicine scoring system in acute chest pain: An observational study of patients presenting with chest pain in the emergency department in Central Saudi Arabia. Saudi Med J 2017;38:900–4.
4. Herrett E, Smeeth L, Walker L, et al. The myocardial ischemia national audit project (MINAP). Heart 2010;96:1264–7.
5. Tavakol M, Ashraf S, Brener SJ. Risks and complications of coronary angiography: a comprehensive review. Glob JHealth Sci 2012;4:65–93.
6. Sajnani N, Bogart DB. Retroperitoneal hemorrhage as a complication of percutaneous intervention: report of 2 cases and review of the literature. Open Cardiovasc Med J2013;7:16–22.
7. Rao SV, Cohen MG, Kandzari DE, et al. The transradial approach to percutaneous coronary intervention: historical perspective, current concepts, and future directions. J Am Coll Cardiol2010;55:2187–95.
8. Manoukian SV, Feit F, Mehran R, et al. Impact of major bleeding on 30-day mortality and clinical outcomes in patients with acute coronary syndromes: an analysis from the ACUITY Trial. J Am Coll Cardiol2007;49:1362–8.
9. Omoigui NA, Califf RM, Pieper K, et al. Peripheral vascular complications in the Coronary Angioplasty Versus Excisional Atherectomy Trial (CAVEAT-I). J Am Coll Cardiol1995;26:922–30.
10. [Gibson CM1, de Lemos JA, Murphy SA, et al.TIMI Study Group. Methodologic and

clinical validation of the TIMI myocardial perfusion grade in acute myocardial infarction. J Thromb Thrombolysis 2002; 14; 233–7.
11. Popma JJ, Satler LF, Pichard AD, et al. Vascular complications after balloon and new device angioplasty. Circulation 1993; 88:1569–78.
12. Waksman R, King SB III, Douglas JS, et al. Predictors of groin complications after balloon and new-device coronary intervention. Am J Cardiol1995;75:886–9.
13. Moscucci M, Mansour KA, Kent KC, et al. Peripheral vascular complications of directional coronary atherectomy and stenting: predictors, management, and outcome. Am J Cardiol1994;74:448–53.
14. Blankenship JC, Hellkamp AS, Aguirre FV, et al. Vascular access site complications after percutaneous coronary intervention with abciximab in the evaluation of c7E3 for the Prevention of Ischemic Complications (EPIC) trial. Am J Cardiol. 1998;81:36–40.
15. Ball WT, Sharieff W, Jolly SS,et al. Characterization of operator learning curve for transradial coronary interventions. Circ Cardiovasc Interv2011;4:336–41.
16. Romagnoli E, Biondi-Zoccai G, Sciahbasi A, et al. Radial versus femoral randomized investigation in ST-segment elevation acute coronary syndrome: the RIFLE-STEACS (Radial Versus Femoral Randomized Investigation in ST-Elevation Acute Coronary Syndrome) study. J Am Coll Cardiol2012;60:2481–9.
17. Jolly SS, Niemelä K, Xavier D, et al. Design and rationale of the RIVAL trial: A randomized comparison of radial vs. femoral access for coronary angiography or intervention in patients with acute coronary syndromes. Am Heart J 2011;161:254-60.e1-4.
18. Agostoni P, Biondi-Zoccai GG, de Benedictis ML, et al. Radial versus femoral approach for percutaneous coronary diagnostic and interventional procedures; systematic overview and meta-analysis of randomized trials. J Am Coll Cardiol. 2004; 44:349–56.
19. Jolly SS, Yusuf S, Cairns J, et al. Radial versus femoral access for coronary angiography and intervention in patients with acute coronary syndromes (RIVAL): a randomised, parallel group, multicentre trial. Lancet 2011;377:1409–20.
20. Valgimigli M, Calabrò P, Cortese B, et al.MATRIX investigators. Scientific foundation and possible implications for practice of the Minimizing Adverse Haemorrhagic Events by Transradial Access Site and Systemic Implementation of AngioX (MATRIX) trial. J Cardiovasc Transl Res 2014;7:101–11.
21. Mehran R, Pocock S, Nikolsky E, et al. Impact of bleeding on mortality after percutaneous coronary intervention results from a patient-level pooled analysis of the REPLACE-2 (randomized evaluation of PCI linking angiomax to reduced clinical events), ACUITY (acute catheterization and urgent intervention triage strategy), and HORIZONS-AMI (harmonizing outcomes with revascularization and stents in acute myocardial infarction) trials. JACC Cardiovasc Interv2011;4:654–64.
22. Mehta SK, Frutkin AD, Lindsey JB, et al. Bleeding in patients undergoing percutaneous coronary intervention: the development of a clinical risk algorithm from the National Cardiovascular Data Registry. Circ Cardiovasc Interv2009; 2:222–9.
23. Moscucci M, Fox KA, Cannon CP, et al. Predictors of major bleeding in acute coronary syndromes: the Global Registry of Acute Coronary Events (GRACE). Eur Heart J 2003;24:1815–23.

How to cite this article: Basunaid. B, Alaydarous. S, Taha. A. et al. Post-Coronary angiography vascular complications in acute coronary syndrome patients. International Journal of Science & Healthcare Research. 2019; 4(2): 121-127.

******