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ORIGINAL ARTICLE

Predictors of Complications at Common Femoral Artery Access Site among Patients on Oral Anticoagulants and Undergoing a Cardiac Catheterization

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ABSTRACT

Introduction: It is not clear whether patients receiving oral anticoagulants (OC) during surgery involving access to the common femoral artery would experience more adverse effects than those not receiving OC. In this analysis, we determine whether patients receiving oral anticoagulants undergoing cardiac catheterization are at high risk of complications related to femoral site than subjects not receiving OACs.

Study Settings: This study was held in the Cardiology department of Qazi Hussain Ahmed Medical Complex, Nowshera and Peoples University of Medical and Health Sciences for Women PUMHSW (SBA) Nawabshah for one-year duration from January 2021 to December 2021.

Methods: A total of 300 patients were selected for the study. We regularly reviewed data from patients undergoing cardiac surgery at the same tertiary care center. A patient was classified as fully or partially anti-coagulated (Group A) if his international normalized ratio (INR) was greater than 1.6 on the surgery day or if he received new OAC or warfarin within 48 hours or less after surgery. The group without anticoagulants (Group B) had an INR of 1.6 or had stopped the new OAC and warfarin more than 48 and 24 hours prior to surgery, respectively.

Results: A total of 300 patients (mean age 65.6±12.2, 60% male) were registered in the study. 20 (6.7%) were in Group A and Group B included 280(93.3%) patients. The intervention was done among 162/300 (54%) patients and received treatment with Intra-procedural anticoagulation with heparin (50.0%), bivalirudin (23.3%) or both (3.3%). GpIIb/IIIa inhibitors were used infrequently (1%).

Conclusions: Compared to patients who did not receive anticoagulants during the procedure, OAC patients experienced no major serious adverse events after 30 days.

Keywords: Oral anticoagulant, Common femoral artery, complications, access site.

INTRODUCTION

Despite the increase in the number of radial interventions, the femoral artery is still the common arterial access route for cardiac catheterization and angiography. Complications related to femoral site access are still rare, occurring in 1% to 17% of operations[1]. Patients receiving oral anticoagulants (OACs) and undergoing common femoral artery access (CFA) procedures often present to the cardiac catheterization lab[2-3]. In the last 3 to 6 years, many new OACs (NOACs; thrombin inhibitors and oral Xa) have arisen and are now used instead of warfarin to treat patients with non-valvular atrial fibrillation or venous thromboembolism[4-5]. According to some data, coronary surgery can be performed safely without interrupting the indexing process.

In this anlaysis, we studied whether patients receiving oral anticoagulants undergoing cardiac catheterization are at high risk of complications related with femoral site than subjects not receiving OACs.

METHODS

This study was held in the Cardiology department of Qazi Hussain Ahmed Medical Complex, Nowshera and Peoples University of Medical and Health Sciences for Women PUMHSW (SBA) Nawabshah for one-year duration from January 2021 to December 2021.

We retrospectively analyzed data from 300 patients who experienced cardiac procedures (interventional or diagnostic) at the Cardiology department. Patients were identified on the basis of a cardiac catheterization procedural log. The clinical investigators reviewed medical records and data records. The Hospital Ethical committee approved the study. The informed consent from participants was taken and confidentiality was maintained. A patient was classified as partially or fully anticoagulated if his international normalized ratio (INR) was greater than 1.6 on the surgery day or if he received NOAC or warfarin within 48 hours or less after surgery (Group A). The group not using anticoagulants (Group B) had an INR of 1.6 or discontinued NOAC and warfarin >48 hours and >24 hours, correspondingly, prior to surgery.

Radial procedures were not included because they were not often performed in our hospital. The primary endpoint of the anlaysis was definite as composite end point of vascular complications such as pseudoaneurysm or atrio-ventricular fistula, major bleeding or the study index was mortality due cardiovascular complication in hospital. The 30-day primary endpoint was considered to be time to index primary endpoint and 30 days post-treatment. Major bleeding, cardiac death, mortality rate, vascular problems such as pseudoaneurysm and atrio-ventricular fistula, myocardial infarction and stroke (embolic or hemorrhagic) were additional secondary endpoints. Angiographic, clinical and demographic data were documented (Table 1).

Major bleeding was considered intracranial or retroperitoneal bleeding, including three units of a drop of hemoglobin or two units of transfusion of blood with an obvious bleeding source. The existence of two of the subsequent symptoms (ST-segment elevation or chest pain and increased troponin) was considered indicative of myocardial infarction. Bleeding requiring intervention (such as discontinuing the OAC or prolonged stay in hospital) but not meeting the major bleeding criteria was defined as clinically important non-major bleeding.

All variables were analyzed descriptively by means of percentages for binary variables and standard deviations and means for variables considered to be continuous. Unadjusted differences between participants who met and failed to meet the composite primary endpoint at 30 days were compared between group A (anticoagulated) and group B (untreated) by Bivariate analysis. Binary logistic regression analysis was accomplished for gender modeling, pre-procedure hemoglobin, active coagulation time, creatinine clearance (CrCl), underweight (<60 kg), fluoroscopy time, heparin dose/weight (kg), body mass index (BMI), urgency, extended procedure time (>90 min), bivalirudin and heparin. Due to nonnormality, CrCl, BMI and active clotting

time were changed by means of the transformation suggested by Johnson. The study of the interaction of variables did not yield significant results. Model determination was done by means of the Hosmer-Lemeshow goodness-of-fit test (P value > 0.05). The Cytel Studio 11 and Minitab 17 programs were used for the analysis.

RESULTS

A total of 300 patients (mean age 65.6±12.2, 60% male) were registered in the study. 20 (6.7%) were in Group A and Group B included 280(93.3%) patients. Patient clinical features and demographics are given in Table 1. The intervention was done among 162/300 (54%) patients and received treatment with Intra-procedural anticoagulation with heparin (50.0%), bivalirudin (23.3%) or both (3.3%). GpIIb/IIIa inhibitors were used infrequently (1%). Most patients (98.0%) used closure devices, mainly Perclose (80%) and Angioseal (20%).

Table-1: shows the baseline variables

Baseline Variables	No	Mean ± S.D
Creatinine clearance (mL/min)		
Males	180(60%)	112.8±41.2
Females	120(40%)	79.6±39.8
Body mass index (kg/m2)		
Males	180	33.10±5.8
Females	120	30.2±8.1
Age in Years	65.6±12.2	
Procedure time (min)	49.8±54.5	
Intraprocedural heparin (units per kg)	90.2±42	
Variables	No	Percentage
History of myocardial infarction	70	23.3%
History of heart failure	30	10%
History of atrial fibrillation	25	8.3%
History of smoking	200	66.7%
Diabetes mellitus	102	34%
Hyperlipidemia	195	65%
Hypertension	202	67.3%
Weight <60 kg	25	8.3%
SBP (>140/90 mmHg) after removal of sheath	35	11.7%
Type of closure device		
Angioseal	60	20%
Perclose	240	80%
Antiplatelet therapy during procedure		
Mono antiplatelet	110	36.7%
Dual antiplatelet	170	56.7%
None	15	5%
Others	5	1.7%
Intra-procedural parenteral anticoagulation		
Heparin	150	50%
Bivalirudin	70	23.3%
Heparin and bivalirudin	10	3.3%
Heparin and GpIIb/IIIa inhibitors	3	1%
bivalirudin and heparin and GpIIb/IIIa inhibitors	2	0.7%
None	65	21.7%
Oral anticoagulation during procedure		
Anti-coagulated (group A)	20	6.7%
Not anti-coagulated (group B)	280	93.3%
Low hemoglobin <10g per dL preprocedure	18	6%
Protracted time of procedure (>90 min)	20	6.7%

6 out of 300 (2% of patients) met the primary composite index endpoint. 16/300 (5.3% of patients) experienced all adverse events from the index procedure. 3/13 cases (18.8%) were found to be probably or definitely correlated to the access site, and 8/16 cases (50%) adverse events were related to the procedures.

There was no difference in Group A (1/20 [5%]) and Group B (09/280 [1.8%; p=0.250) for the primary composite endpoint of the index.

Table-2: shows the adverse events comparison in Group A and B

Adverse events	Group A (Orally anti-coagulated)	Group B (nonanti-coagulated)	Total	P-value
Index adverse events	N=20	N=280	300	
Clinically relevant nonmajor bleed	1	4	5	
Major Bleeding	2	2	4	
Complications of Vascular system	1	2	3	
Mortality due to cardiac issue	1	3	4	
Total adverse events	5	11	16	0.62
Adverse events definitely or might be related to procedure			8/16	
Adverse events definitely or might be related to access site			3/16	
At index; Primary composite endpoint (vascular complications, major bleeding, and Mortality due to cardiac issue), n (%)	1	5	6	0.250
30-day adverse events				
Clinically relevant non-major bleed	1	4		
Major Bleeding	2	7		
Complications of Vascular system	0	2		
Mortality due to cardiac issue	0	3		
Total adverse events	3	16	19	
Adverse events definitely or might be related to procedure			6/19	
Adverse events definitely or might be related to access site			8/19	
30-day Primary composite endpoint at index, (vascular complications, major bleeding, and cardiac mortality), n (%)	1	10	11	0.097

11/300 (3.6%) patients met the 30-day composite primary endpoint (Table 2). 19/300 (6.3%) patients experienced all adverse events within 30 days of the procedure. Of these, 8/19 (42.1%) were found to be probably or definitely correlated to the access site and 6/19 (31.6%) to the procedure. The 30-day composite primary endpoint showed no difference in Group A (1/20 [5%] and Group B (10/280 [3.5%]; p=0.097). After 30 days; no variance was noted in the total adverse events in group A (P=1.000).

In bivariate analysis (Table 3), primary endpoint at thirty days, less than 60 kg of body weight (P=0.0029), decreased CrCl (P=0.0001), low baseline hemoglobin (P=0.0397), female gender (P=0.0312), high dose intraoperative heparin (units/kg; P=0.0280) and raised BMI (P=0.0031) was observed in group B compared to group A. There was no correlation between the cardiac catheterization type done (intervention vs cardiac catheterization) and the primary adverse event during the intervention (0.92% and 1.29%, correspondingly, p=0.575) or after a month (p=1000). Though, subjects undergoing interference in group B had high primary adverse events ratio at one month in comparison to patients in group B done with cardiac catheterization.

Table-3: shows the unadjusted differences at 30-day primary composite endpoint

Variables	Total	No of end points met	30-day primary end point met	P-value
Males	180	174(96.7%)	7(63.6%)	0.034
Females	120	116(96.7%)	4(36.4%)	
Weight				
≥60 kg	25	22(88%)	3(27.3%)	0.0029
<60 kg	275	267(97.1%)	8(72.7%)	
cardiac catheterization				
Cardiac intervention	162	158(97.5%)	4(36.4%)	
Cardiac	140	133(95%)	7(63.6%)	0.575

catheterization				
Creatinine clearance (mL/min)	250	239	11	0.0001
Heparin/weight (units per kg)	172	161	11	0.0280
Preprocedure hemoglobin (g/dL)	138	130	8	0.0397
Body mass index (kg/m2)	272	261	11	0.0031

DISCUSSION

Adverse reactions were observed in 1.6% of patients during index coronary angiography. The range of reported complications at access site were in standard range. Compared to patients not receiving OAC anticoagulation, there was no increase in the primary composite endpoint of major bleeding, vascular complications (pseudoaneurysm or atrioventricular fistula) or mortality due to cardiac issue during hospital stay[6-8]. This was true regardless of the intraoperative anticoagulant. However, no patients were given thrombolytic therapy and only 1% of the patients in our group received GPIIb/IIIa inhibitors, these data are not valid for these patients[9-10]. In addition, these data are not applicable to patients undergoing manual compression hemostasis as most patients in this study were received the closure device[11-13]. Data on the effectiveness of vasoconstrictors in reducing complications after femoral artery access in patients undergoing cardiac surgery are inconclusive. However, more recent data suggest that closure devices are more effective in minimizing complications during diagnostic or interventional cardiac procedures[14].

Finally, patients with radial access (inadequate usage of the beam in our laboratory) were not included in this study. According to a recent study, both femoral and radial access were safe after PCI, but there were fewer vascular complications with radial access. In contrast, the approach of femoral artery with a vessel-closure device (Angioseal) is comparable to the radial approach in terms of minimizing problems during cardiac surgery[15-16]. Though, studies exhibited that radial access with warfarin continuously have fewer vascular complications. In this trial, univariate analysis showed that the adverse primary composite endpoints increased with increasing units per kg of unfractionated heparin given during procedure[17-18]. Regardless of the level of anticoagulation, intra-procedural anticoagulant treatment rise the vascular problems risk in warfarin users. However, multivariate analysis showed that intra-procedural heparin did not predict adverse outcomes when adjusting for CrCl and lean subjects (<60 kg). Renal failure is an important indicator of adverse outcomes after cardiac surgery. In a study of 8,519 participants examining the association between glomerular filtration rate and overall- mortality cause, a decrease in endurance after catheterization was observed that was associated with a decrease in glomerular filtration rate (GFR)[19-20]. According to this study, the relative risk of death increased by about 17.2% for every 10 units of decreased GFR. This is consistent with studies showing that increasing CrCl reduces the risk of composite endpoints such as major bleeding, vascular complications and cardiovascular death occurring within 30 days (OR 0.56). In addition, numerous studies have shown a link between vascular problems and a high or low BMI[21-22].

In our study, there was an independent risk factor for complications in patients who were taking oral anticoagulants is being underweight (<60 kg). Combined adverse events at 30 days included longer procedure duration, pre-procedure low hemoglobin, OAC and immediate or urgent treatment (cardiac and non-cardiac death, major bleeding, vascular complications, myocardial infarction, stroke and) was estimated.

CONCLUSION

In patients plan for cardiac catheterization, renal failure and low body weight (<60 kg) but not OAC, were independent predictors of the rate or combined endpoints of vascular complications, major bleeding, or mortality due to cardiovascular issue up to 30 days. The results apply only to subjects planned for femoral vascular access and not getting lytic therapy or inhibitors of GPIIb/IIIa.

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