Effect of Changing Position on Patient Outcomes after Transfemoral Diagnostic Cardiac Catheterization

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Abstract: *cardiac catheterization is associated with vascular complications . To prevent these complications, patients are restricted toprolonged bed restin a supine position that is always accompanied by back pain and low satisfaction level.**Objective:**The purpose of this study was to investigate the effect of changing position on patient outcomes of back pain, vascular complications "bleeding and hematoma" and patient satisfaction after transfemoral diagnostic cardiac catheterization. **Setting:** The study was conducted at the Cardiac Catheterization Unit in the Cardiology Department of Alexandria Main (Smouha) University Hospital, Egypt. **Material and Methods:**This is a quasi experimental study. Data were collected from 40 patients, who had undergone diagnostic cardiac catheterization via the femoral arterywere randomly assigned into two equal study groups.Patients in the controlgroup werereceived a routine hospital care. The patients' position in the experimental group was changed and using supportive devices at the first, second and third 2hr after the procedure.The intensity of back pain and presence of vascular complicationswereassessed at regular intervals during first 6hr after the procedureand the level of satisfaction after the 6hr of catheterization.Biosociodemographic structured questionnaire, and patient outcomes assessment sheet, were utilized for data collection. **Results:**None of studied patients developed vascular complications (100%). Patients in the experimental group had significantlyhigher decrease in back pain intensity than the controls after catheterization(p=<0.001). Also the experimentalsubjects werehighly statistically significant increase in satisfaction level than the controls (p=<0.001). **Conclusion**: changing patients' position and using supportive devices after diagnostic cardiac catheterization are associated with decrease back pain intensity and increasing the satisfaction level without increasing vascular complications.*
Keywords:Position, Back pain, Coronary arterydisease, Cardiac catheterization,Satisfaction level,Vascular complications (bleeding &hematoma)..

I. Introduction

Coronary arterydiseases (CAD) are the leading cause of death all over the world [1].It is considered one of the master reasons of disease burden in developing and developed countries [2,3].In Egypt,According to the most recent WHO information distributed in 2017coronary artery disease deaths in Egypt reached 126,312 or 24.58% of total deaths.The Death Rate is 216.82 for every 100,000 of population ranks Egypt #18 in the world[4].

Several methods are utilized for diagnosis and treatment of heart diseases, such as:chest X-ray, exercise stress test, echocardiograph,cardiac catheterization, andelectrocardiogram[5].Although many noninvasive diagnostic techniques have been commonly used, cardiac catheterization still remains the most definitive procedure and currently is the golden standard for the examination of various types of coronary and structural heart diseases[5,6].

A heart catheterization is excessively used for diagnostic evaluations in patients with cardiovascular diseases.Generally,In 1929, "Werner Forssmann" was the first to propela catheter into the heart. These days, cardiac catheterization is performed routinely in clinical regions all around the globe[7].Per year, around 3 millioncardiac catheterizations are performed in the United States.To dodiagnostic cardiac catheterization, the entrance to heart is set up through a catheter, which in over 90% of casesexecuted through the percutaneous femoral artery[8,9].

Cardiac catheterization (CC) is a minimally invasive procedure utilized for both diagnostic and treatmentreasons[10]. It includes theinsertion of a catheter into a cardiovascular vessel"coronary catheterization" or chamber by method for a reasonable vascular access, usually a femoral artery. Once in place, the catheter is used to perform hemodynamic evaluations which include measuring pressure within heart, cardiac output and

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oxygen saturation in various heart chambers.Also,it can be utilized to play out a heart tissue biopsy, and in addition opennarrowed or blockedparts of a coronary artery through percutaneous coronary intervention (PCI)[11].

There are twomajor categories of cardiac catheterization, right heart catheterization and left heart catheterization.At the point, when the catheter is embedded throughthe femoral vein and then advanced to the right ventricle and the pulmonary artery, the technique is called right heart catheterization.This is used to assess tricuspid and pulmonary valve function, in addition to, measure the pressure levels in the right ventricle and the pulmonary artery. If the catheter is advanced through the femoral artery and into the left ventricle to testthe blood flow in the coronary arteries, as well as the level of function of the aorta, mitral valves and left ventricle. The technique is called left heart catheterization[12,13].

In spite of the fact that,transfemoral cardiac catheterizations are accomplished by skin perforation under local anesthesia. However, it may be associated with some adverse events[14].Cardiac catheterizations (CC)have many complications such astemporary back pain, dysrrhythmias, pseudoaneurysm, arteriovenous fistula, infection, vascular access complications, including bleeding and hematoma. In addition,perforation of cardiac chamber, air embolism, cerebrovascular accident, allergic reactions to the contrast andacute renal failure might be encountered .Vascular complications are considered the most common adverse events after diagnostic cardiac catheterization. In general, the incidence of vascular complications is close to 1% for diagnostic CC and 3% for percutaneous coronary intervention[7,15].

After cardiac catheterization, to limit potential vascular complications,the nurse must apply direct pressure either manual or mechanical to the femoral artery for 10-20 minutes, until hemostasis is achieved. Additionally, the patients are instructedto strict immobilization and complete bed rest in the supine position for at least six hours immediately after the test, the head of the bed no higher than 30 degrees during period of bed rest,as well asthe affected limbshould be keptstraightand immobilized [16,17]. Such a position, while lessening the vascular complications of the procedure, often leads to patient discomfort , dissatisfaction , and increase the risk of developing back pain. Increased costs, health system resources used , length of hospital stay and also an increase in nursing task load are all expected [8,18,19].

Haghshenaset al (2013) and Heravi et al (2015) illustrated that,back pain is commonly reported after transfemoral cardiac catheterization due to aprolonged period of bed rest in the supine position.Accordingly, the patients wish to change their position inorder to lessenthe backache and discomfort[18,19].Pain leads to various unsafe impacts through activating the biological stress response.Thus, the autonomic nervous system is activated and releases catecholamine. These events may increase blood pressure,heart rate, myocardial workload, oxygen utilization, and finally myocardial infarction.Therefore, the nurses require a safe protocol based on research and evidence base to promote patients satisfaction and comfortafter cardiac catheterization without increasing the risk of vascular complications, and also decrease costs and period of hospitalization [19,20].

Aim of the study:
This study aimed to investigate the effect of changing position on patient outcomesof back pain, vascular complications "bleeding and hematoma" and patient satisfaction after transfemoral diagnostic cardiac catheterization.
Research hypothesis:
Hypothesis1: Patients who receive changing position after transfemoral diagnostic cardiac catheterization exhibit less back pain intensity than those who don't receive it.
Hypothesis2: Both studied groups who receive and not receive changing position after transfemoral diagnostic cardiac catheterization had a similar and no effect on the incidence of vascular complications.
Hypothesis 3: Patients who receive changing position after transfemoral diagnostic cardiac catheterization exhibit more satisfaction level than those who don't receive it.

II. Material And Methods

Material
Research design: A quasi experimental research design was used for the aim of the study.
Setting: The study was conducted at the Cardiac Catheterization Unit in theCardiology Department of Alexandria Main (Smouha) University Hospital, Alexandria, Egypt.
Subjects:A convenience sample of 40 adult male and female patients who were admitted the previous mentioned setting for performing diagnostic cardiac catheterization through the femoral artery, were divided randomly by using (computer generated rondmization) into two equal groups (control and experimental), twenty patients each.All studied patients were selected according to the following criteria:
1- Adult male and female patients undergoing transfemoral diagnostic cardiac catheterization.
2- Aged 20- 60 years old.
3- Able to read and write .

4-   Controlled blood pressure .

5-   All patients undergoing transfemoral diagnostic cardiac catheterization had a sheath size range from six to nine French sheath.

6-   Had no bleeding disorders.

7-   Not receiving anti-coagulant and analgesictherapy within the previous 24 hours before the procedure.

8-   Without lowback pain problems.

9-   Free from complications developed during cardiac catheterization.

Sample size calculation: EPI INFO program was used to calculate the sample size applying the following information:

Population size = 60 for 3 months.

Expected frequency = 50%.

Acceptable error = 10%.

Confidence co-efficient = 95%.

Minimum sample size = 37.

Toolsfordata collection: In order to fulfill the objective of the study, two tools were used for data collection.

Tool I:Biosociodemographic data   structured questionnaire: This was questionnaire developed by the researchers based on review of the literature to obtain information about biosociodemographic data of the studied patients[7,8,20,21].It consisted of two parts as the following:

Part I :Sociodemographic dataas gender, age,marital status, area of residence,educational level, occupation, and economic status.

Part II :Clinical data: This part was utilized to obtain data about the clinical history of the patients and their families such as main complaints, smoking and family history related to cardiovascular diseases.

Tool II:Patient outcomes assessment sheet:This tool was developed by the researchers based on review of the literature to assess the following point[7,8,20,21,22,23].

1-   Affected limbwas assessed three times (at the first ,second and third 2 hours after the catheterization) for color,temperature, sensation ,capillary refill , and peripheral pulse.

2-   Vital signs were measuredat the first ,second and third 2 hours after the procedure.

3-   Vascular complications (hematoma and bleeding): The femoral puncture site was observed and palpated for presence or absence of bruising and swelling. Also dressing was observed for bleeding atthefirst ,second and third 2hours after the procedure.

4-   Back pain intensity:The Numeric Pain Intensity Scale was used to assess the level of back pain intensity ranging from no pain (scored = 0) to worst (scored = 10). It was adapted fromHjermstadet al (2011)[22].

5-   Patient satisfaction level was assessed through using visual analog scale,this scale contains extremely satisfied = 5, satisfied = 4 , neither satisfied nor dissatisfied = 3 , dissatisfied = 2 , extremely dissatisfied = 1 items to be rated by respondents. It was adapted from Voutilainen et al (2015)[23].

Methods

1. An official permission was obtained from the hospital authorized personalof the study setting after explanation of the aim of the study.

2. Tool (I)and Tool (II), were developed based on review of relevant literature.

3. **Content and construct validity of the study tool** were established by a jury composed of five experts in the fields of Cardiology and Medical Surgical Nursing. The necessary modifications were modified accordingly.

4. **Reliability of the tools** wasestablished by using Cronbach's Alpha Coefficient Test (= 0.942) which indicated that, the tools were reliable.

5. **A pilot study**was conducted on 10% of the total sample who were undergoing transfemoral diagnostic cardiac catheterization and fulfilled the inclusion criteria to test the clarity, objectivity, feasibility, relevancy and applicability of the study tools,accordingly, the necessary modificationswere done. This pilot study patients were not included in the study sample .

6. **Data collection and implementation of the study:**

- After securing the administrative approval, data collection was started and continued for a period of 4 months (from February 2018 to May 2018.).

- **Before the invasive cardiac catheterization** :Sociodemographic and clinical data were obtained from the subjects medical record and directly from the patient,these included patientmain complaints, as well as medical and family history.

- **After the invasive cardiac catheterization procedure:**The sheath removed immediately post cardiac catheterization by the nurse . Homeostasis was achieved by 15 minutes of manual compression, followed by a compression bandage. **In the control group**, patients were left to the hospital routine care (complet bed rest in the supine position for at least six hours , the head of the bed no higher than 30 degrees during period of bed

rest , and the affected limp kept straight).**In the experimental group**, the patients started to   modifying changing position through the following phases:

Phase I: (first 2 hours afterthe procedure) the patients rested in supine position.

Phase II:(second 2 hours after the procedure) the patients rested in a side-lying position.

Phase III:(third 2 hours after the procedure) the patients rested in a semi-fowler position.During position changes supportive devices as small pillow were used to support body parts (head,neck,shoulder,lumber curvature and between knee), and the affected leg was maintained straight.Patients were instructed to support the puncture site while turned.

-        All patientis in both studied groups were asked about back pain intensity three times at first 2hr , second 2 hr and third 2 hr after the procedure .

-        All studied patientis were asked about their satisfaction level of care after 6 hours of transfemoral diagnostic cardiac catheterization . Control subjects were asked about the routine hospital care and the experimental subjects asked about modifying changing position by using supportive devices .

7.**Ethical considerations**: An Ethical Committee permission wasobtained to conduct the study. The purpose of the study was explained to all the studied patients , and all of them signed the informed consent before participation, and were assured about the privacy, freedom and confidentiality to participate in the study.

8. **Statistical analysis**, data were analyzed using IBM SPSS statistics program version 21[24,25]. Categorical variables were summarized by frequency and percent. Chi-square test was used to study significant association between two categorical variables. Fisher exact and Montecarlo significance were used if more than 20% of total expected cell counts <5 at .05 level of significance.

III. Results

Table 1:presentscomparisons between the two studied groups according to sociodemographic data.It can be noticed that, males represented higher percentages (85.0%, 70.0%) ofgroups I&II, respectivelywith no statistical significant   differences ([FE]p=0.451).More than half of the participants in group I and II(55.0 %,80.0%) respectively, were in the age group of 50 and morewithout   statistical significant   differences ([MC]p=0.212).The majority of both groups were married , live in urban area , no significant differences was detected between the two groups regarding marital status and area of residence   ([MC]p= 0.798), (p=0.144) respectively. As regards the level of education and occupation,the table illustrates that, no statistical significant differences was observed between the two studied groups ([MC]p=0.321, 0.081) respectively. Moreover, 60.0%of patients of group I and 70.0% of patients of group II reported that, income was enough. The difference between the two studied groups regarding income was not statistically significant (p=0.507).

Table 1: Comparisons between the two studied groups according to socio-demographic data.

Socio-demographic data	Control (I) (n = 20)		Experimental (II) (n = 20)		χ^2	P
	No.	%	No.	%		
Gender						
Male	17	85.0	14	70.0	1.290	[FE]p= 0.451
Female	3	15.0	6	30.0		
Age						
30 –	2	10.0	0	0.0	3.333	[MC]p= 0.212
40 –	7	35.0	4	20.0		
50 and more	11	55.0	16	80.0		
Marital Status						
Married	18	90.0	16	80.0	1.704	[MC]p= 0.798
Single	1	5.0	1	5.0		
Divorced	0	0.0	1	5.0		
Widow	1	5.0	2	10.0		
Area of residence						
Rural	7	35.0	3	15.0	2.133	0.144
Urban	13	65.0	17	85.0		
Educational level						
Read & write	6	30.0	1	5.0	5.720	[MC]p= 0.321
Primary	1	5.0	7	35.0		
Preparatory	4	20.0	0	0.0		
Secondary	3	15.0	4	20.0		
University and above	6	30.0	8	40.0		
Occupation						
Employee	6	30.0	12	60.0	7.940	[MC]p= 0.081
Worker	5	25.0	1	5.0		
Pension	1	5.0	3	15.0		

Housewife	3	15.0	3	15.0		
Free work	5	25.0	1	5.0		
Economic status						
Not enough	8	40.0	6	30.0		
Enough	12	60.0	14	70.0	0.440	0.507

χ^2: Chi square test   MC: Monte Carlo   FE: Fisher Exact   p: p value for comparing between the two groups

Table 2: presents comparisons between the two studied groups according to clinical data. The table shows that , 65.0% of the patients in group I compered to 75.0% of the patients in group II have past history of hypertension , with no statistical significant difference (p=0.490). Moreover, around half of the studied partcipants have past history of diabetes mellitus, with no statistical significant difference had observed between two groups (p=0.525). About three quarters 75.0% in group I and 55.0% in group II were smokers with no statistical significant difference observed (p= 0.185). In relation to the main complaints , the table displays that, the majority of groups I and II (70.0% ,85.0%) respectively, were complaining of dyspnea. Also no statistical significant differences was detected between the two studied groups([FE]p=0.451). Furthermore , the findings presented that, more than half of the studied patients reported family history of cardiovascular disease , and there was no statistical significant difference between the two studied groups ([FE]p=0.695).

Table 2: Comparisons between the two studied groups according to clinical data.

Clinical data	Control (I) (n = 20)		Experimental (II) (n = 20)		χ^2	P
	No.	%	No.	%		
Past history **1- Hypertension**						
No	7	35.0	5	25.0	0.476	0.490
Yes	13	65.0	15	75.0		
2- Diabetes mellitus						
No	10	50.0	8	40.0	0.404	0.525
Yes	10	50.0	12	60.0		
3-Ischemic heart disease						
No	11	55.0	16	80.0	2.849	0.091
Yes	9	45.0	4	20.0		
4-Smoking						
No	5	25.0	9	45.0	1.758	0.185
Yes	15	75.0	11	55.0		
Main complains #						
Chest pain	12	60.0	17	85.0	3.135	0.077
Dyspnea	14	70.0	17	85.0	1.290	[FE]p=0.451
Palpitation	11	55.0	7	35.0	1.616	0.204
Fatigue	3	15.0	3	15.0	0.000	[FE]p=1.000
Family history related cardiovascular disease						
Absent	3	15.0	5	25.0	0.625	[FE]p=0.695
Present	17	85.0	15	75.0		

χ^2:   Chi square test   MC: Monte Carlo FE: Fisher Exact   p: p value for comparing between the two groups
#:The patient's response more than one answer

Table 3: shows comparisons between the two studied groups according to vital signs at the first, second and third 2 hours after the procedure. In relation to body temperature, pulse and respiration at first, second and third 2 hours after the procedure, the table reflected that, the vast majority of all studied patients have normal body tempreture , pulse and respiration , and no statistical significant difference was detected at the first 2 hours ([FE]p=1.000). Concerning blood pressure at the first and second 2 hours after the procedure , the table displays that, more than half of the studied patients in both groups have normal blood pressure, while around one quarter of the studied subjects in the two groups had hypertension. Also the difference between the two studied groups was not statistically significant ([MC]p=0.153),([FE]p=1.000) respectively. Of interest (100%) of patients in groups I and II had normal blood pressure at the third 2 hours after the procedure.

Table 3: Comparisons between the two studied groups according to vital signs at the first, second and third 2 hours after the procedure.

Vital signs	First 2hr after procedure				Second 2hr after procedure				Third 2hr after procedure			
	Control (I) Supineposition (n = 20)		Experimental (II) Supineposition, usingsupportive devices (n = 20)		Control(I) Supineposition (n = 20)		Experimental(II) side-lying position,using supportivedevices (n = 20)		Control(I) Supineposition (n = 20)		Experimental(II) semi-fowler position,using supportive devices (n = 20)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Temperature												
Normal	20	100.0	19	95.0	20	100.0	20	100.0	20	100.0	20	100.0
Hypothermia	0	0.0	1	5.0	0	0.0	0	0.0	0	0.0	0	0.0
Hyperthermia	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
χ^2(p)	1.026(^{FE}p=1.000)				-				-			
Pulse												
Normal	20	100.0	19	95.0	20	100.0	20	100.0	20	100.0	20	100.0
Tachycardia	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Brady cardia	0	0.0	1	5.0	0	0.0	0	0.0	0	0.0	0	0.0
χ^2(p)	1.026 (^{FE}p=1.000)				-				-			
Respiration												
Normal	20	100.0	19	95.0	20	100.0	20	100.0	20	100.0	20	100.0
Tachypnea	0	0.0	1	5.0	0	0.0	0	0.0	0	0.0	0	0.0
Bradypnea	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
χ^2(p)	1.026 (^{FE}p=1.000)				-				-			
Blood pressure												
Normal	18	90.0	13	65.0	18	90.0	18	90.0	20	100.0	20	100.0
Hypertension	2	10.0	5	25.0	2	10.0	2	10.0	0	0.0	0	0.0
Hypotension	0	0.0	2	10.0	0	0.0	0	0.0	0	0.0	0	0.0
χ^2(p)	3.633 (^{MC}p=0.153)				0.000(^{FE}p=1.000)				-			

χ^2: Chi square test   MC: Monte Carlo   FE: Fisher Exactp: p value for comparing between the two groups

Table 4: presentscomparisons between the two studied groups according to assessment of theaffected limb at the first , second and third 2 hours after the procedure.In relation to color of affected limb, at the first 2 hours after the procedure, the table presents that, the majority of studied patients in groups I andII (80.0 % , 65.0%) respectively were normal(pink) color , with no statistical significant difference (p=0.288).Also at the second and third 2hours after the procedure , there is no statistical significant difference was observed between bothgroups(^{FE}p=1.000).Tempreture of affected limb at the first 2 hours , more than half of both studied groups IandII (80.0% ,65.0%) respectively were warm tempreture of affected limp . Also , the table points that , at the second and third 2 hours of the procedure ,the vast majorty of both studied groups IandII (100.0% ,95.0%) respectivelywere having warm affected limb.

Furthermore , the table presents that, all patients in groups I and II had sensation of the affected limb at the first,second and third 2 hours after the procedure . It was observed that, 95.0%of patients in group I compared to 85.0% of patients in group II were normal capillary refillwith no statistical significant difference having detected between the two studied groups (^{FE}p=0.605).All the subjects related to group I and II had normal capillary refill at both the 2nd and 3rd two hours post procedure . Concerning peripheral pulse of affected limb at the first and second 2 hours after procedure , the table indicates thatno statistiacal significant difference was observed between the twogroups(^{FE}p=1.000),also the majority of group I &II were having normal peripheral pulse of the affected limb.

Table 4: Comparisons between the two studied groups according to assessment of theaffected limb at the first , second and third 2 hours after the procedure

Assessment of the affected limb	First 2hr after procedure				Second 2hr after procedure				Third 2hr after procedure			
	Control(I) Supineposition (n = 20)		Experimental(II) Supineposition, usingsupportive devices (n = 20)		Control(I) Supineposition (n = 20)		Experimental(II) side-lying position,usingsup portivedevices (n = 20)		Control(I) Supineposition (n = 20)		Experimental(II) semi-fowler position,using supportive devices (n = 20)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Color of affected limb												

	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Normal (pink)	16	80.0	13	65.0	20	100.0	19	95.0	20	100.0	19	95.0
Pallor	4	20.0	7	35.0	0	0.0	1	5.0	0	0.0	1	5.0
χ^2(p)	1.129 (0.288)				1.026 (^{FE}p=1.000)				1.026 (^{FE}p=1.000)			
Temperature of affected limb												
Warm	16	80.0	13	65.0	20	100.0	19	95.0	20	100.0	19	95.0
Cold	4	20.0	7	35.0	0	0.0	1	5.0	0	0.0	1	5.0
χ^2(p)	1.129 (0.288)				1.026 (^{FE}p=1.000)				1.026 (^{FE}p=1.000)			
Sensation of affected limb												
Present	20	100.0	20	100.0	20	100.0	20	100.0	20	100.0	20	100.0
Absent	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
χ^2(p)	-				-				-			
Capillary refill of affected limb												
Normal < 2sec	19	95.0	17	85.0	20	100.0	20	100.0	20	100.0	20	100.0
>2 sec	1	5.0	3	15.0	0	0.0	0	0.0	0	0.0	0	0.0
χ^2(p)	1.111 (^{FE}p=0.605)				-				-			
Peripheral pulse of affected limb												
Normal	16	80.0	15	75.0	20	100.0	19	95.0	20	100.0	20	100.0
Decreased	4	20.0	5	25.0	0	0.0	1	5.0	0	0.0	0	0.0
Couldn't be feel	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
χ^2(p)	0.143 (^{FE}p=1.000)				1.026 (^{FE}p=1.000)				-			

χ^2: Chi square test   FE: Fisher Exact   p: p value for comparing between the two group

Table 5:reveals comparisons between the two studied groups according to patient outcomes of back pain and vascular complications at the first , second and third 2 hours after procedure. As regardes severity of back pain, it was noticed that , less than one quarter of the studied patients in both groups I and II (15.0%) ,(20.0%) respectively ,were reported no back pain at first 2 hours after the procedure , and there is no statistical significant difference was observed between two studied groups (^{MC}p=0.851), while at second 2 hours after the procedure,more than one third of the studied patients in group I (45.0%) were reported modrate back pain , and `more than half of the studied patients in groupII (65.0%)were reported no back pain , also there is highly statistically significant difference was observed between two studied groups p=(^{MC}<0.001*). Moreover, at third 2 hours after the procedure the table reflected that, half of the studied patients in group I (50.0%) were reported worst back pain, while three quarters of the studied patients in group I I (75.0%) were reported no back pain,and there is   highly statistically significant difference was detected between the two studied groups (^{MC}p= <0.001*).In relation to vascular complications (hematoma and bleeding), it was observed that , an equal percentage (100%) of patients in both groups I and II were no vascular complications .

Table 5: Comparisons between the two studied groups according to patient outcomes of back pain and vascular complications at the first , second and third 2 hours after procedure.

Patient outcomes after transfemoral diagnostic cardiac catheterization	First 2hr after procedure				Second 2hr after procedure				Third 2hr after procedure			
	Control(I) Supineposition (n = 20)		Experimental(II) Supineposition, usingsupportive devices (n = 20)		Control(I) Supineposition (n = 20)		Experimental(II) side-lying position,using supportivedevices (n = 20)		Control(I) Supine position (n = 20)		Experimental(II) semi-fowler position,using supportive devices (n = 20)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Severity of back pain												
No pain (0)	3	15.0	4	20.0	1	5.0	13	65.0	1	5.0	15	75.0
Mild pain (1 – 3)	6	30.0	8	40.0	4	20.0	5	25.0	2	10.0	3	15.0
Moderate pain (4–6)	6	30.0	5	25.0	9	45.0	2	10.0	7	35.0	2	10.0
Worst pain (7 – 10)	5	20.0	3	15.0	6	30.0	0	0.0	10	50.0	0	0.0
χ^2(^{MC}p)	1.123 (0.851)				21.642*(<0.001*)				27.434*(<0.001*)			

Vascular complications (Hematoma and bleeding)											
Absent	20	100.0	20	100.0	20	100.0	20	100.0	20	100.0	20	100.0
Present	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
χ^2(p)	-			-			-				

χ^2: Chi square test   MC: Monte Carlo: p value for comparing between the two groups
*: Statistically significant at p ≤ 0.05

Table 6 : showscomparisons between the two studied groups regarding patient's satisfaction level after procedure.Thetable demonstrateshigh statistical significant differences among the twostudied groups (p= <0.001*). It isrevelead that,60% of experimental group subjects were satisfied compered to 55% of the controls who were dissatisfied .The overall χ^2 was 19.424 and p= <0.001* .

Table 6 : Comparisons between the two studied groups regarding patient's satisfaction level after procedure.

Patient's satisfaction level	Control(I) (Routine hospital care) (n = 20)		Experimental(II) (Modifying position and using supportive devices) (n = 20)		χ^2	MCp
	No.	%	No.	%		
Are you satisfied about your body position after transfemoral diagnostic cardiac catheterization?						
Extremely dissatisfaction	2	10.0	0	0.0		
Dissatisfaction	11	55.0	1	5.0		
Natural	3	15.0	2	10.0	19.424*	<0.001*
Satisfaction	4	20.0	12	60.0		
Strong satisfaction	0	0.0	5	25.0		

χ^2: Chi square test   MC: Monte Carlop: p value for comparing between the two groups
*: Statistically significant at p ≤ 0.05

IV.   Discussion

Cardiac catheterization is mostly accepted as a practical diagnostic and treatment choice for coronary heart diseases. Although cardiac catheterization has reduced morbidity and mortality for cardiovascular diseases, it may result in a variety of complications[26,27,28,29].These complications range from minor problems to major problems that may require immediate intervention. Hence, this procedure requires specialized medical and nursing interventions that should be carried out by skilled and competent staff. Cardiac catheterization nurses play a critical role in delivering care after diagnostic cardiac catheterization as well as who need to engage in safe protocol and developing an evidence base to improve patient outcomes, promote patient safety, reducing complications, additionally increase patient satisfaction after the diagnostic cardiac catheterization procedure[30,31] . Therefore, the current study was conducted to investigate the effect of changing position on patient outcomes of back pain, vascular complications and patient satisfaction after transfemoral diagnostic cardiac catheterization.

The results of this study indicated that,mostof the studied patients in both groups were males. This finding was in line withDrabaa and Majed (2011) and Elsaid et al (2015)whoreported that ,more than halfof their studied patients were males. This phenomena could be due to life stree exposure and smoking which can cause the blood vessels to narrow[31,21]. Hence, any types of heart disease occur.While this result contradict withGaliuto (2015)who noticed that, cardiac catheterization procedure due to CVD occurssimilarly in men and women especially after menapause , because estrogen deficiency leads to several structural and functional changes in cardiovascular system which increase of cardiovascular risk[32].

The present study findings indicated that more than half of the studied patients in both groups were between age 50 and more, This result is in agreement withDrabaa and Majed (2011) who had reported that ,the average age of their studied patients were 50 to 69 years[31]. This could be justified by that, the increasing mean age of cardiac patients in Egypt reflects the universal trend of cardiac patients living longer due to improving health care systems. Moreover , The findings have indicated that there was no statistically significant difference in age and gender in the two study groups. These parameters were important to be equally distributed among the two study groups because of their possible relations to the occurrence of vascular complications. This is in congruence with Ahmed (2015) who reported that age, and sex are known to be predictive of vascular complications after cardiac catheterization[7].Kobrossi et al(2014) found that there were no differences between their two groups study with respect to age, gender,educational level and body mass index[33].

As regardsfamily and patient past history the findingsrevealed that , the majority of the patients in the two groups have family history related to cardiovascular disease(CVD) as well as had history of hypertension, diabetes mellitus and smoking with no statistical differences between both groups .These results stand in line with the findings of Tewari et al (2013) who reported that, patients undergoing transfemoral diagnostic cardiac catheterization have history of hypertenstion (HTN), diabetes mellitus (DM) and smoking .There were no statistical differences between the two groups in terms of cardiovascular risk factors, family history of CVD and clinical presentation as well [34].

The present study also pointedoutno statistical significant differences between the experimental and control subjects in blood pressure and heart rate hours post procedure . This finding contradicts with the findings of Adaryani et al (2009) who illustrated that,the mean heart rate and blood pressure were lower in the experimental subjects compared with their controls at 6 and 8 hours after catheterization[35].However, the finding of the current study is supported bythe findings of Farmanbar et al (2012) who reported that,no statistical significant differences in blood pressure at regular intervals among control and experimental subjects post procedure [36].

The findings of this study showed that, the vast majority of patients in the experimental and control subjects had experienced normal affected limb regarding color, temperature, sensation, peripheral pulse and capillary refill. This finding was supported by Kaushal(2015) who reported that, post cardiac catheterization the affected limb must be warm, with normalperipheral pulse and color ,as well as without any abnormal sensation such as numbness[37].

Regarding back pain the findings showed that, patients in the control group experienced more back pain compared to the experimental.This could be due to the prolonged bed rest without any change in the patients' position.This shows that the more the patients' rest in the supine position after femoral diagnostic cardiac catheterization, the more intense back pain they would experience [36,38]. Moreover,The results illustrated that, change patients position after femoral diagnostic cardiac catheterization was associated with a lower level of back pain intensity. This is in line with findings of Adaryaniet al (2009)and Abdollahi et al (2015) who reported that patients may be able to safely change their position in bed earlier in the postcoronary angiography, additionally changing position in bedand using a supportive pillow during the early hours after cardiac catheterization can effectively minimize back painand hemodynamic instability without increasing vascular complications[35,8].This also in congruence with Sabzaligol et al (2010)andThangkratok (2016) who reported that back pain intensity was lower in the intervention group than the control one after 6 and 24 hours of catheterization (P<0.001)[39,40].

The results showed that,all studied patients in both groups have no incidence of vascular complications including bleeding and hematoma after transfemoral diagnostic cardiac catheterization.This could be justified by that,the incidence rate of vascular complications after diagnostic cardiac catheterization(CC) is close to 1% [7,15,41]. These findings come in accordance withFarmanbar et al (2012) who reported that , changing position and early ambulation after femoral diagnostic CC do not increase the risk of vascular complications, can bring patients some comfort, and result in their earlier discharge from hospital [36].It is also congruent with findings of Abdollahi et al (2015) whomentioned that, none of the subjects in their study experienced bleeding or hematoma,changing patients' position can be safe and they can be ambulated early after diagnostic angiography[8].

As for satisfaction with theprocedure among patients in the two study groups, the present study has also demonstrated statistically significant differences. The findings have elucidated that patients' satisfaction was lowest in the control group, and higher in the experimental group.This possibly could be due to the fact that , changing position in bed is frequently associated with patients comfort and decreasedintensity of back pain which helped to increase patient satisfaction level .This result was in line with a study conducted byAdaryani et al (2009) and Mohammady et al (2014)who ascertained that , patients in the experimental group had significantly higher comfort and satisfaction than the controls at 3, 6, 8 hours and the next morning after femoral diagnostic cardiac catheterization (P < 0.01).Furthermore , changing patients' position after cardiac catheterization are associated with increasing comfort and satisfaction levels without increasing the amount of bleeding and hematoma[35,42].

V. Conclusions
Based on the findings of the current study, it can be concluded that, changing patients' position in the bed by using supportive devices after transfemoral cardiac catheterization was safe and associated with a lower level of back pain intensity and improving patient satisfaction with noeffects on vascular complications (bleeding &hematoma).

VI. Recommendations

- Establishing a standardized protocol for best positioning after transfemoral diagnostic cardiac catheterization.
- Cardiac catheterization unit need to encourage changing position policy post cardiac catheterization to improve patientsatisfaction and comfort.
- Further nursing studies should investigate the longerterm effects of changing position after transfemoral diagnostic cardiac catheterization by expanding the follow-up periods.

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