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Impact of Early Ambulation on Patients' Outcome Post Transfemoral Coronary Procedures, at Assiut University Hospital

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Abstract

Cardiac catheterization remains the most definitive procedure for diagnosis and evaluation of coronary artery disease. **Aim**: this study was carried out to investigate the impact of early ambulation post transfemoral coronary procedures on back pain, urinary discomfort and vascular complications. **Design**: a quasi-experimental design. **Setting**: in catheterization and coronary care units. **Subjects**: A convenience sample of all adult educable and mentally competent male and female patients aged from (18-60 years old) who are scheduled for non-emergency percutaneous coronary intervention (PCI) and coronary angiography (CA) through femoral artery during a period from july 2010 to june2011 were eligible for inclusion in the sample. **Tools**: Four tools were utilized to collect data pertinent to the study, **tool** assessment of patients after femoral sheath removal and angioplasty data **tool II: assessment** of back pain tool **III**: urinary discomfort assessment tool. **tool IV**: vascular complications measurement after femoral cardiac catheterization **Methods**: patients in the study group were ambulate after **four hours** bed rest post transfemoral PCI and 2 hours after CA, whereas patients in the control group were ambulate after 12–24 hours post transfemoral PCI and 6-8 hours after CA(usual care). **Results**: Finding of the present study revealed that a significant statistical difference was existed between both studied groups in relation to back pain and urinary discomfort for PCI and CA. As regards to vascular complication, no significant statistical differences were put into evidence between both studied groups. **Conclusion**: early ambulation is safe and feasible for patients undergoing PCI and CA.

Key words: early ambulation, femoral coronary procedures, back pain, urinary discomfort, nurse's role, and vascular complications.

1. Introduction

Cardiac catheterization is considered the gold standard for the diagnosis, evaluation, and treatment of cardiac diseases**.(Rezaei-Adaryani 2009)** Although it can be performed through brachial, radial, or femoral arteries **(Woodrow 2005)** The transfemoral puncture is the most common approach. However, because vascular complications occur in 0.43–5.8% of transfemoral cardiac catheterization patients, strict bed rest and immobilization of the catheterized leg have been considered essential to reduce the risk of their development. The recommended bed rest duration after transfemoral cardiac catheterization varies from two to 24 hours. Many patients find it difficult to use the bedpan or urinal in the recumbent position during bed rest; moreover, studies reported that back pain severity increased with longer duration of bed rest after cardiac catheterization **(Chair et al. 2007).**

Prolonged bed rest in supine position varies from 4 to 24 hours and there is no recommendation on the optimal duration of such a bed rest. The most frequent complaints from patients during prolonged bed rest are back pain and urinary discomfort. Besides, anxiety and anger due to the unmet needs for comfort are also expressed by patients.**(Chair etal. 2012)**To relieve these discomforts caused by prolonged bed rest, early ambulation has been proposed and its effectiveness has also been examined by various studies**..(Rezaei-Adaryanietal.2009)**

1.1**Nursing responsibilities for patients undergoing to cardiac catheterization**

Before cardiac catheterization the cardiac nurse should instruct the patient to fast, usually for 8 to 12 hours, before the procedure, prepare the patient for the expected duration of the procedure ,medication is given before the goes to the catheterization laboratory as mild sedatives and antihistamins, explain that an occasional pounding sensation (palpitation) may be felt in the chest because of extra systoles that always occur, particularly when the catheter tip touches the myocardium. The cardiac nurse instruct the patient to cough may help to disrupt a dysrhythmia and to clear the contrast agent from the arteries. Breathing deeply and holding the breath helps to lower the diaphragm for better visualization of heart structures. The critical care nurse should monitor all preliminary laboratory tests, including cardiac enzymes, serum electrolytes, and coagulation studies (prothrombin time and partial thromboplastin time). Serum potassium, creatinine, and blood urea nitrogen (BUN) are particularly important**. (Morton et al.2009)**.

During cardiac catheterization, the cardiac nurse applies an intravenous line for the administration of sedatives, fluids, heparin, and other medications. Noninvasive hemodynamic monitoring that includes blood pressure (BP) and multiple electrocardiography (ECG) tracings is necessary to continuously observe for dysrhythmias or hemodynamic instability. The myocardium can become ischemic and trigger dysrhythmias as catheters are positioned in the coronary arteries or during injection of contrast agents. Resuscitation equipment must be readily available during the procedure. **(Smeltzer etal.2008)**

After cardiac catheterization, critical care nurse plays an important role in observing and assessing the patient's status from head to toe, noting the overall skin color and temperature and carefully observing the level of consciousness. Alter the patient is transferred the bed and attached to the monitor, the nurse listens closely to heart and breath sounds. The nurse evaluates the peripheral circulation by noting peripheral skin color and temperature of the dorsal pedals and posterior tibia pulses. **(Urdan eta.2006)**

The nurse instructs the patient on the importance of keeping the involved leg straight and the head of the bed angled tip no more than 45 degrees. The nurse plays a significant role in observing and assessing angina that recurs soon after a PCI procedure. Any chest pain demands immediate and careful attention because it may indicate either the start of vasospasm or impended occlusion. **(Mortan &Fontaine 2005)**.If the post-PCI course is uncomplicated, the sheaths are removed after 3 to 4 hours, and a pressure dressing is applied to the site. A variety of mechanical clamps or hemostasis devices may he used to facilitate homeostasis after sheath removal. The patient must continue complete bed rest for 4 to 12 hours after the sheaths are removed. A normal, low-sodium, or low-cholesterol diet may be resumed, depending on the preference of the physician and the needs of the patient **(Applegate & Grabarczyk 2002)**

2.Patients and methods

2.1Aim of the study

The aim of this study is to investigate the impact of early ambulation post transfemoral coronary procedures on back pain, urinary discomfort and vascular complications.

2.2Hypothesis: To fulfill the aim of the study the following research hypothesis were formulated:-

- The post mean back pain scale of the study group subjects will be lesser than their pre mean back pain scale of the control group **among PCI and CA**
- The post mean urinary discomfort scale of the study group subjects will be lesser than their pre mean urinary discomfort scale of the control group **among PCI and CA**
- The frequency of post transfemoral PCI vascular complications for patients who will be exposed to the designed early ambulation protocol will be not increased **among PCI and CA**

2.3 Research design

Quasi experimental research design has been utilized in this study.

2.4 Setting:

This study was carried out in catheterization and coronary care units.

2.5 Sample:

A convenience sample of all adult educable and mentally competent male and female patients aged from (18-60 years old) who are scheduled for non-emergency percutaneous coronary intervention (PCI) and coronary angiography (CA) through femoral artery during a period of twelve months from July 2010 to june2011 were eligible for inclusion in the study .They were assigned into both study and control groups.

2.5.1The following inclusion criteria were considered: All patients had a six French sheath, normal prothrombin time . (10-14 seconds) (Urdenetal 2010),normal renal function test.(BUN is 5 to 25 mg/dl, creatinine is 0.5 to 1.5mg/dl)(Urdenetal 2010),thermodynamically stable.

2.5.2The following exclusion criteria were considered, coagulation abnormalities, hypertension, chronic lower back pain, transradial coronary angioplasty,groin pathology, previous surgery in the iliac or femoral arteries, complications developed during coronary angioplasty

2.5.3 Matching criteria were considered**,** age range of (1-3 years)**,**sex**,**the same level of educations**(**read and write**),** the same size of sheath**(**6F**),** the same dose of heparin

2.6.Study tools

Four tools wereused to collect the data in this study.

2.6.1 Tool I:Patient assessment sheet after femoral sheath removal and angioplasty data. This tool consists of two parts and developed by the researcher after review of literature (4-7,17):

2.6.1.1 Part I: socio- demographic and angioplasty data which includes**:**age,sex past medical history, hospital stay and time of hemostasis to assess patient's profile

2.6.1.2 Part II: assessments after femoral sheath removal, which includes pulse, mean arterial blood pressure and peripheral pulse assessment to assess vital signs and catheterized leg.

2.6.2. Tool II: Assessment of back pain tool: in this study, Visual Analogue Scale (VAS) used to assess each patient's back pain intensity and pain changes. **This tool adopted from chair etal 2009** and consists of a 100 mm long line with the left anchor representing 'no pain', and the right anchor representing 'the worst possible pain'. Patients were asked to place amark indicating tha degree of their current back pain on the line at each assessment time.

2.6.3. Tool III:Urinary discomfort assessment tool,This tool adopted from chair etal 2012 and includes 5 point Likertscale ,with the left anchor representing " strongly disagree", and the right anchor representing 'strongly agree".

2.6.4. Tool IV: Vascular complication measurement after femoral cardiac catheterization: This tool was adopted from Rezaei etal.(2009),and used to measure the amount of bleedding and hematoma.The borders of hematoma were first determined by palpation technique and then were measured by using two dimensional rulers with 1cm2 precision. Whereas, bleeding was determined by observing the dressing on puncture site and measuring the surface area of bleeding on the dressing by the same ruler.

3.Content validity: the tools were tested for content related validity by jury of 5 specialistits in the field of critical care nursing and coronary medicine from Assiut University and Cairo University, and the necessary modifications were done.

4. A pilot study was conducted on 30 patients after explain the nature and purpose of the study (22 patients with CA and 8 patients with PCI) to test the feasibility and applicability of the tools. The analysis of the pilot study revealed that minimal modifications are required. These necessary modifications were done and the pilot study subjects were excluded from the actual study.

5.-Protection of human rights:

An Official approval was obtained from hospital administrative authority to collect the neceeary data after explanation of the aim and nature of the study. Patients' anonymity and confidentiality were ascertained. Written consent was obtained from patients who are willing to the study. The Reliability was done on study tools by cronback'salpha(0.95).

6.Procedure

The study was conducted on two phases

6.1 Preparatory phase

- The patient admitted early in the morning at the catheterization unit. The researcher was obtained demographic and clinical data from the patient medical record as well as directly from the patient such as the patient age, sex and past medical history.
- Heart rate and mean arterial pressure were measured using bedside monitor connect to the wall by three cardiac electrodes.
- Peripheral pulse was measured by palpitation in the popliteal and dorsal pedals arteries.

6.2 Implementation phase

6.2. 1 After PCI procedure

- After the invasive procedure at the catheterisation laboratory, patients returned to the unit with the sheath in place. Four hours after administration of the last dose of heparin, the activated clotting time (ACT) was measured. ACT was measured repeatedly until it was below the 3-4 minutes.
- When ACT was below the3- 4 minutes, the physcian of the unit removed the sheath (Schikset al. 2007).
- Haemostasis was achieved by 15 minutes of manual compression, followed by a compression bandage during four hours.
- **In the study group,** patient started to mobilize directly after removal of the pressure dressing. During the immobilization period the patient was allowed to elevate the head of the bed to 45°.
- Ambulation was carefully staged in both groups. First the patient sat on a chair for 10 minutes, and then the patient walked on the ward with assistant. When there was no discomfort and no sign of a bleeding or a haematoma, the patient was allowed to walk on the ward on his own, for at least 200 meter.
- The extent of mobilization was categorized into 'very limited mobility', i.e. only in the patient's room, 'slightly limited mobility', i.e. in the patient's room and on the ward but also sitting on a chair and 'full mobility,' i.e. mobilizations on the ward. Patients were instructed to recognize puncture site complications and to warn the nurse. Also it was explained what they were not allowed to do during mobilization, e.g. lifting heavy things and biking on home trainer.
- The researcher performed several inguinal inspections. These inspections consisted of examinations of the puncture site and the patients were also asked about pain and sensation. In the early ambulation

group these inspections were performed before ambulation and after each stage of ambulation, and the next morning by using VAS.

- Back pain was assessed immediately before ambulation ,after 10 minutes, after walk and in the next morning after cardiac catheterization
- Urinary discomfort was assessed immediately before ambulation, after 10 minutes, after walk and in the next morning after cardiac catheterization by using of afive -point Likert scale
- **Inthe control group**, patients in the control group received usual care and stayed in bed till 8:00 am the next morning. the inspections were performed after removal of the pressure dressing, two hours following this removal, and the next day before and after ambulation. In case of a suspected puncture site complication the patient returned to bed rest overnight and a physician was consulted.

6.2.2 After CA procedure

- After the invasive procedure at the catheterization laboratory, patients returned to the unit and sheath removed immediately post CA**.**
- Hemostasis was achieved by 15 minutes of manual compression, followed by a compression bandage during two hours.
- **In the study group,** patient started to mobilize directly after removal of the pressure dressing. During the immobilization period the patient was allowed to elevate the head of the bed to 45°.
- **In the control group,** the patients in the control group received usual care and stayed in bed from 6-8 hours. The inspections were performed after removal of the pressure dressing and after ambulation. In case of a suspected puncture site complication the patient returned to bed rest overnight and a physician was consulted.

- **Statistical design**

  Data was collected and analyzed by computer programmed SPSS (ver.16) .Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations for qualitative variables. Qualitative variables were compared using chi-square test to determine significance for non-parametric variables-test used to determine significance for numerical variables. The critical value of the tests "P" was considered statistically significant when P less than 0.05.

7.Results

7.1 (Table 1) shows ,in relation to PCI(**therapeutic cardiac catheterization**), that 60% of the study and control groups were in the age group of 50-60 years old , concerning to medical diagnosis , 95% and85 % had previous anginaof the study and control groups. There was no significant statistical difference between the two groups in relation to age, and medical diagnosis. (p=0.992 and p=0.321 respectively)**Regarding to CA**(**diagnostic cardiac catheterization)**, It noticed that 63.6% and 58.1 % of the study and control groups were in the age group of 50-60 years old,, concerning to medical diagnosis, 27.3% and 22.7% had previous anginaof the study and control groups ,there were no significant statistical difference between the two groups in relation to age and medical diagnosis.(p=0.686 and 0.731respectively)

7.2.Figure (1) shows that 75% ,80% of both the study and the control groups among the PCI and the CA groups were males

7.3 (Table 2) shows in relation to PCI(**therapeutic cardiac catheterization**), the mean bed rest hours for study and control groups were **4.20±0.89and 11.15±1.87** hours with high significant statistical difference between them p=0.001 .As regards to the mean time of compression to achieve hemostasis for study and control groups ,it was**18.25±2.712** and **16.75±3.041** minutes with no significant statistical difference between both groups . Concerning to hospital stay, all patients stayed as the same period of time in study and control groups. **Regarding to CA**(**diagnostic cardiac catheterization)**, the mean bed rest hours for study and control groups were **2.0±0.01 and 5.9±0.61** hours with high significant statistical difference between both groups p=0.001.As regards to the mean time of compression to achieve hemostasis for study and control groups ,it was **11.6±2.9** and **9.6±2.5** minutes with significant statistical difference between both groups p=0.001 Concerning to hospital stay, all patients stayed as the same period of time in study and control groups

7.4 (Tale 3) shows in relation to PCI(**therapeutic cardiac catheterization**), significant statistical difference between study and the control groups in relation to pulse before sheath removal, immediately before ambulation and ambulation next morning. As regards to the mean arterial blood pressure high significant statistical difference between the study and the control groups in next morning ambulation was found.(p=0.004).Regarding to CA(**diagnostic cardiac catheterization)**, significant statistical difference between the study and the control groups in relation to pulse before sheath removal was found p=0.043 and high significant statistical difference between study and the control groups in relation to pulse in the ambulation after walk p=0.001 . As regards to

the mean arterial blood pressure significant statistical difference between study and the control groups before sheath removal and Immediately before ambulation was found .(p=0.011 and 0.019 respectively).

7.5 Table(4)shows that ,in relation to PCI, a significant statistical differences between study and control groups regarding the mean score for degree of back pain after walk, and ambulation next morning p=0.002,0.004 respectively.**As regards CA** , a significant statistical differences between study and control groups concerning the mean score for degree of back pain, 10 minutes after ambulation ,after walk p=0.001 Thus,this hypothesis can be supported

7.6 (Table 5) shows in relation to PCI(**therapeutic cardiac catheterization**),,this table shows that significant statistical difference between study and the control regarding the mean score for urinary discomfort after walk,ambulation next morning.p=0.096 ,p=0.001**.Regarding to CA**(**diagnostic cardiac catheterization)**,this table shows that significant statistical difference between study and the control regarding the mean score for urinary discomfort after 10 minutes and after walk.p=0.001Thus,this hypothesis can be supported**.**

7.7 (Table 8) show ,in relation to PCI(**therapeutic cardiac catheterization**), no significant statistical differences between control and study groups in relation to hematoma before ambulation , after 10 minutes ,after walk and ambulation next morning (p= 0.731).this hypothesis can be support. Regarding to CA(**diagnostic cardiac catheterization)** no significant statistical differences between study and control groups in relation to hematoma before ambulation , 10 minutes after ambulation ,after walk and ambulation next morning, this hypothesis can be supported.

8. **Discussion**

Percutaneous coronary intervention for acute coronary syndrome or non–ST elevation myocardial infarction requires the use of potent oral and intravenous anti - platelet and antithrombin medications. Although these potent antithrombotic agents and regimens may increase the effectiveness of percutaneous coronary intervention, they are also generally associated with an increased risk of vascular access site complications such as hematoma, retroperitoneal hematoma, pseudo aneurysm, arterial occlusion, and arteriovenous fistula, which in turn are associated with increased morbidity, mortality, and costs. Merriweather & Sulzbach-Hoke (2012)

The present study presented that the majority of both groups in PCI were in age group 50 to 60 years old and most patient were males .This can be attributed to the higher exposure to life stress, and female hormones protect female from CAD. This in line with (Andrea 2010) who studied early sheath removal and ambulation in patients submitted to PCI: A randomized clinical trial, found that 64% of the study sample were males, and their mean age were 59.7%years old.

The current study revealed that the majority of the studied patients were married. This is in line with (Basuny 2009) state tthat the effect of position changing post coronary angiography on patient's outcomes, which revealed that the majority of the studied sample was married.

Back pain is a major and universal problem resulting from prolonged bed rest after coronary procedures as reported by both qualitative and quantitative Lunden et al.(2006). The present study revealed that patients in the control group experienced more back pain post percutaneous coronary intervention than patients in study .Hoglund etal .(2010)in line with current study who found that back pain was one of the complaints frequently reported by patients who were required for strict bed rest and immobilization after CC. Chair etal. (2007) findings about patient's responses to transfemoral coronary angioplasty concluded that the patient complaints of back pain related to immobility Difficulty with urination is also another common problem encountered. Most patients are not used to using the urinal bedpan. As reported in a local study conducted by Chair et al.(2007) patients with 12 to 24 hours of bed rest experienced higher levels of urinary discomfort (p = 0.006) than those who were able to ambulate after four hours of bed rest. As personally witnessed in the clinical setting, urinary problems are more profound among male patients suffering from benign prostatic hypertrophy.Also,Chair etal (2003) presented that urinary discomfort was examined in this study and found that patients expressed negative feelings about the terrible urge to urinate post procedure and the difficulty in urinating by using a bed ban or urinal. The current study shows that no statistical significant differences between both groups in patients undergoing to PCI and CA in relation to bleeding and hematoma. Kalapatapu etal (2006), indicated that, some estimate that complications related to the access site result in more than 75,000 surgical procedures annually.(Scheffer 2003)performed that a goal following cardiac catheterization is to reduce vascular complications, especially hematoma formation, the most common access site complication.

However, Agostoni etal.(2006) stated that the incidence of vascular access complications alone has ranged from 0.1% to 61%, depending on the definition of complications, the type of procedure, anticoagulation, closure devices, age, sex, and other patient co-morbidities. (Domontetal 2006) added vascular complications expose patients to additional discomfort, extended hospital stay, and higher hospital costs. Oozing and ecchymosis are considered minor complications post PCI. Oozing can be resolved through continued manual pressure until the

oozing has subsided. Ecchymosis is a common complication and is accompanied by pain and minor swelling.During the first twenty-four hours after the procedure, a warm compress may be appliedto the site to ease discomfort .Dressler & Dressler(2006).

In this well done and clinically relevant study, by Chair et al. (2012) published in this issue of The Anatolian Journal of Cardiology, the authors evaluate the impact of early ambulation on back pain, puncture site pain, vascular complications, urinary discomfort, general well-being and patient satisfaction in a single blinded randomized controlled trial performed at a single center in Hong Kong. All study patients underwent catheterization via femoral access and access site hemostasis was achieved by manual compression in all patients. In the experimental group, patients ambulated 4 hours post-procedure and in the control group, patients ambulated only after 12 to 24 hours bed rest. There was no difference in the vascular complications between the two groups. Early ambulation was associated with a significant reduction in back pain, decreased urinary discomfort, and increased general well-being. However, no significant benefit with respect to puncture site pain or patient satisfaction was observed. This study substantiates the results of previous studies provides further evidence that early ambulation after cardiac catheterization improves patient comfort without compromising safety. The safety and feasibility of further reducing bed rest to two hours post sheath removal was tested in a randomized controlled trial conducted by Vlasic et al. (2001) with a fairly large sample size of 299 patients who underwent angioplasty with a median of 7 Fr catheters. No increased risk of hematoma formation and bleeding at the groin site following sheath removal was found in the two-hour bed rest group (n = 99) compared to the four-hour (n = 99) and six-hour (n = 101) groups.

To reduce complications, manual or mechanical application of firm pressure above the puncture site is needed. Moreover, prolonged bed rest in recumbent position and immobilization of the affected leg are also required for those patients after sheath removal .Steffenino etal .(2006). Nurses on the front line caring for patients before, during and after cardiac catheterization play a key role in the prevention of complications. With the increasing number of cardiac catheterizations performed, evolving technology, and advances in pharmaceutical therapy comes an increased risk of vascular complications Andrea etal .(2010)

Finally, the major finding of the study was that ambulation 4 hours after PCI could reduce back pain, urinary discomfort and increase general well-being of the patients. However, effect of early ambulation on puncture site pain, puncture site bleeding, was not significantly different between the two groups

9. Conclusion and Recommendations

Based on the findings of the present study, it can be concluded that early mobilization after diagnostic and therapeutic cardiac catheterization via femoral artery access with 6 French sheaths can be done safely without any significant vascular complications. Early ambulation reduced back pain and urinary discomfort.
In the light of the above, the following recommendations are suggested:-

- Establishing a standardized protocol for early ambulation after diagnostic and therapeutic cardiac catheterization.
- Developing protocol using a smaller sheath sizes and radial artery access.
- Apply clinical practice guidelines for optimal patient care after femoral cardiac catheterization.
- Early ambulation should be added to the routine care.
- Studing the risk factors associated with local complication for patient undergoing cardiac catheterization

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Table 1: Comparison between the study and control groups in relation to socio demographic data among PCI and CA

Socio demographic data	PCI (therapeutic cardiac catheterization)					CA(diagnostic cardiac catheterization)				
	study N=40		control N=40		P. value	Study N=110		control N=110		P. value
	No	%	No	%		No	%	No	%	
Age group <40 years 41- 50 years 51 -60 years	4 12 24	10.0 30.0 60.0	4 12 24	10.0 30.0 60.0	0.992	6 34 70	5.5 30.9 63.6	6 40 64	5.5 36.4 58.1	0.686
Mean±SD(year)	50.15±7.611		50.45± 8.965		0.911[Ns]	51.1±6.7		50.4±6.2		0.441 [Ns]
Medical diagnosis										
Hypertension	22	55.0	18	45.0	0.321	70	63.6	75	68.2	0.731
Diabetes mellitus	18	45.0	16	40.0		10	9.1	10	9.1	
Previous angina	38	95.0	34	85.0		30	27.3	25	22.7	
Previous MI	8	20	14	35.0		75	68.2	70	63.6	

Ns: There is no significant statistical difference **-**Chi-square test **-** independent samples t-test * significant at($p \leq 0.05$,),MI: myocardial infarction, PCI, percutaneous coronary intervention, CA, coronary angiography

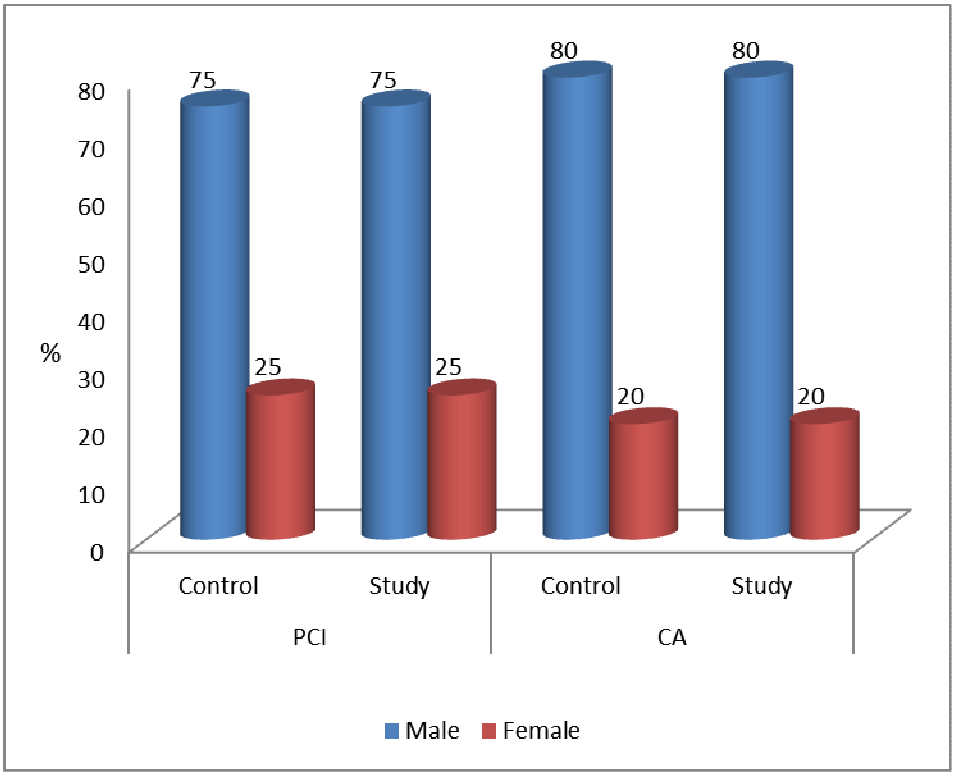

Figure (1) percentage distribution of the studied groups (PCI and CA) in relation to gender

Table 2: Comparison between the study and control groups in relation to bed rest ,time of compression and hospital stay among PCI and CA(mean ±SD)

Bed rest , time of compressionand hospital stay	PCI (therapeutic cardiac catheterization)			CA(diagnostic cardiac catheterization)		
	study N=40	control N=40	p.value	study N=110	control N=110	p.value
	Mean±SD	Mean±SD		Mean±SD	Mean±SD	
Duration of bed rest after PCI/CA (hours)	4.20±0.89	11.15±1.87	0.001 **	2.0±0.01	5.9±0.61	0.001**
Time of compression to achieve hemeostasis(minutes)	18.25±2.712	16.75±3.041	0.108	11.6±2.9	9.6±2.5	0.001**
Hospital stay (%)						
(less than one day)	0	0	0	100	100	NA
(more than one day)	100	100	NA	0	0	0

-Chi-square test * significant at ($p \leq 0.05$)**, PCI**, percutaneous coronary intervention, **CA**, coronary angiographyNA,not applicable

Table 3: Comparison between the study and control groups in relation to pulse and mean arterial blood pressure (MAP) assessment after sheath removal among PCI and CA (Mean±SD).

Pulse and MAP	PCI (therapeutic cardiac catheterization)			CA(diagnostic cardiac catheterization)		
	study N=40	control N=40	P. value	study N=110	control N=110	P. value
Pulse	**Mean±SD**	**Mean ±SD**		**Mean±SD**	**Mean±SD**	
Before sheath removal	72.1 ±7.341	78.35 ±10.874	0.040*	74.5 ±8.3	76.7 ±7.8	0.043 *
Immediately before ambulation	69.35±4.499	79.1± 10.657	0.001**	76.3 ±8.0	77.5 ±6.7	0.258
10 minutes after ambulation	70.2 ±4.073	78.8± 10.68	0.002**	78.5 ±7.2	77.5 ±5.8	0.258
Ambulation after walk	71.7 ±3.57	79.8± 9.44	0.001**	80.9 ±8.0	77.8 ±5.7	0.001 **
Ambulation next morning	72.35±5.234	75.7± 3.484	0.034*	--	-	-
MAP						
Before sheath removal	91.85±6.761	90.05 ±10.133	0.516	92.6 ±6.4	90.9 ±2.3	0.011 *
Immediately before ambulation	89.65±6.393	88.5± 8.703	0.634	92.7 ±5.0	91.4 ±2.9	0.019 *
10 minutes after	88.75±6.	88.2± 8.237	0.820	91.1	91.4 ±1.9	0.743

ambulation	927			±8.8		
Ambulation after walk	89.95±7.082	89.85±8.851	0.969	91.1±8.8	91.4±1.9	0.743
Ambulation next morning	90.05±8.042	63.7±7.917	0.004**	--	--	-

Independent samples t-test * significant at ($p \leq 0.05$) **MAP**: mean arterial pressure

Table (4); Comparison between the study and control groups in relation to the degree of back pain score among PCI and CA

Degree of back pain	PCI (therapeutic cardiac catheterization)			CA(diagnostic cardiac catheterization)		
	study N=40	control N=40	P. value	study N=110	control N=110	P.value
	Mean±SD	Mean±SD		Mean±SD	Mean±SD	
Immediately before ambulation	1.15±1.03	0.85±1.25	0.307	0.7±0.91	0.6±0.74	0.779
10 minutes after ambulation	2.45±1.34	2.0±0.85	0.156	1.33±1.01	2.67±0.79	0.001**
Degree of pain after walk	3.05±0.503	3.85±0.73	0.002**	0.51±0.83	1.73±0.78	0.001**
Ambulation next morning	3.15±0.58	3.95±0.75	0.004**	0	0	0

Independent samples t-test * significant at ($p<0.05$)

Table (5); Comparison between the study and control groups in relation to the degree ofurinary discomfort as reported among PCI and CA groups

Urinary discomfort	PCI (therapeutic cardiac catheterization)			CA(diagnostic cardiac catheterization)		
	study N=40	control N=40	P. value	study N=110	control N=110	P. value
	Mean±SD	Mean±SD		Mean±SD	Mean±SD	
Immediately before ambulation	2.55+0.68	2.3+0.46	0.200	2.5+0.68	2.1+0.44	0.114
After 10 minutes ambulation	2.1+0.44	2.5+0.68	0.114	0.87+0.94	1.6+0.73	0.001**
Ambulation after walk	1.35+0.56	1.45+0.98	0.096*	0.96+0.95	1.8+0.67	0.001**
Ambulation next morning	0.38+0.70	1.0+0.72	0.001**	0	0	0

Independent samples t-test * significant at ($p \leq 0.05$)

Table (6); Comparison between the study and contorl groups in relation to vascular complication among PCI and CA

vascular complication	PCI (therapeutic cardiac catheterization)					CA(diagnostic cardiac catheterization)				
	Study		control		P.value	Study		control		P.value
	No	%	No	%		No	%	No	%	
Before ambulation										
Hematoma <5cm	10	25.0	9	22.5	0.731	88	86	95	86	0.139
Hematoma >5cm	0	0	0	0		0	0	0	0	
Ecmosis	20	50.0	26	65.0	0.174	92	83	88	80	0.299
10 minutes after ambulation										
Hematoma <5cm	10	25.0	9	22.5	0.731	88	86	95	86	0.139
Hematoma >5cm	-	-	-	-		0	0	0	0	
Ecmosis	20	50.0	26	65.0	0.174	92	83	88	80	0.299
after walk in the room										
Minor bleeding	15	37.5	13	32.5	0.401	0	0	0	0	
Hematoma <5cm	10	25.0	9	22.5	0.731	99	0.9	106	96.4	0.161
Hematoma >5cm	0	0	0	0		0	0	0	0	
Ecmosis	20	50	26	65	0.174	92	83	88	80	0.299
Ambulation next morning										
Hematoma <5cm	10	25.0	9	22.5	0.731	-	-	-	-	
Hematoma >5cm	-	-	-	-		-	-	-	-	
Ecmosis	20	50.0	26	65.0	0.174	-	-	-	-	

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