

EFFECT OF POSITIONING ON BLEEDING COMPLICATION AND LOW BACK PAIN AFTER DIAGNOSTIC CORONARY ANGIOGRAPHY IN PATIENTS WITH CORONARY HEART DISEASE IN AN INTEGRATED HEART CARE CENTER IN INDONESIA

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Abstract

Background: Coronary angiography can cause complications of arterial and subcutaneous bleeding (hematoma) and back pain. Changing the position of the patient (positioning) in bed can reduce the pain post-diagnostic catheterization complications.

Objective: This study was to examine the effect of positioning on bleeding complication and low back pain after diagnostic coronary angiography in patients with coronary heart disease patient in the Integrated Heart Care Center in Indonesia.

Methods: This study was a true-experimental study with randomized posttest-only control group design. Thirty respondents were randomly selected using simple random sampling, which 15 respondents were randomly assigned in the experiment group and control group. The experiment group was given a positioning with 15°, 30°, 45° head-of-bed elevation in left and right lateral position. An arc tool was used to measure the height of head of bed elevation, a measuring cup to measure arterial bleeding using, a perforated transparent plastic with 5 cm diameter to measure subcutaneous bleeding (hematoma), and Numeric Pain Rating Scale to measure low back pain. Data were analyzed using Kolmogorov-Smirnov and Repeated Measured ANOVA.

Results: Findings showed that positioning had no effect on arterial hemorrhage ($p=1.000$) and subcutaneous bleeding (hematoma) ($p=0.999$). Repeated ANOVA test results revealed that positioning had a significant effect on low back pain ($p=0.017$).

Conclusion: There was no significant effect of positioning on the occurrence of arterial and subcutaneous bleeding (hematoma), but there was a significant effect in reducing low back pain.

Keywords: positioning, arterial bleeding, subcutaneous bleeding, back pain

INTRODUCTION

Coronary Heart Disease (CHD) is one of the most common cardiovascular diseases (43% of total cardiovascular disease) and it is considered as the highest cause of death globally. World Health Organization (WHO) reports that the mortality rate of CHD in the world reached 7.4 million annually and

continues to increase ([WHO, 2012](#)). CHD is the leading cause of death in developed and developing countries, and half of the world's population now living in the countries in Asia. The proportion of deaths from CHD in Southeast Asian countries including Thailand 60 / 100,000 population per year, Malaysia

105 / 100,000 population per year, and Indonesia 170 / 100,000 population per year ([Hata & Kiyohara, 2013](#)).

According to data and information center of the Ministry of Health, the province of Central Java ranks third for CHD cases with number of patients based on medical diagnosis of 120,447 people (0.5%) and also based on doctor / symptom diagnosis of 337,252 persons (1.4%) ([MOH, 2014](#)). Cardiovascular invasive diagnostics is an act of diagnostic testing to determine invasive diagnosis of heart and blood vessel abnormalities. It is called invasive because it inserts a small tube (catheter) into the heart through a vein or arterial vessel, whereas non-cardiovascular surgical intervention is an action taken to treat heart and blood vessel abnormalities using methods outside surgery ([RSCM, 2013](#)).

The management of cardiology is done by developing various techniques and procedures with percutaneous methods. Generally, percutaneous actions performed on patients with Coronary Artery Disease (CAD) are Diagnostic Coronary Angiography (DCA) and Percutaneous Coronary Intervention (PCI) ([Woods, 2010](#)). DCA is a more accurate assessment technique for evaluating hemodynamic status compared with non-invasive testing. This action is a standard examination for diagnosing coronary heart disease and is used as the primary method to describe the anatomy of coronary arteries (spot, stiffness, morphology of lesions, coronary blood flow, and collateral vessels) ([Olade, 2016](#)). Coronary angiography is a diagnostic act, and PCI is intervention action. Coronary angiography can lead to complications of bleeding and hematoma as well as patients' discomfort ([Bonow, Mann, Zipes, & Libby, 2011](#)).

The incidence of vascular complications varies in number. A previous study indicated that 8.9% of a total sample of 90 patients experiences a hematoma incidence ([Sinaga, Nurachmah, & Gayatri, 2012](#)), supported by another study indicated that of 40

respondents, 5.5% of them had local vascular complications and 11.1% had femoral neuropathy ([Manik, 2015](#)).

Nursing actions to minimize vascular complications after coronary angiography are manual suppression for 20-30 minutes after femoral sheath removal, measuring and evaluating vital signs every 15 minutes in the first hour and every hour until the third hour; palpating the pulse in the blood vessel area of catheter access, peripheral temperature, skin color and capillary refill time, and patients are recommend bed rest 2 - 4 hours on PCI / PCA ([Sinaga et al., 2012](#)).

Post-angiographic patients require prolonged bed rest, which can cause back pain, orthostatic hypotension, elimination problems, comfort disorders, etc ([Panggabean HA, 2011](#)). Studies state that the greatest inconvenience of hospital care for patients requiring a coronary diagnostic and / or intervention procedure is the length of time they are required to lie down after femoral arterial sheath release ([Armendaris, Azzolin, Alves, Ritter, & Moraes, 2008](#); [Potter & Perry, 2005](#)). Low Back Pain (LBP) is a frequent complaint due to immobilization.

Thus, positioning is a self-directed nursing action that is deliberately done to provide the body's position in improving physical or psychological wellbeing or comfort ([Panggabean HA, 2011](#)). Study states that there is a difference of a significant degree of comfort between positioning and non-positioning patients (ρ value <0.05), which patients who do not change positions suffering more back pain ([Armendaris et al., 2008](#)). This is supported by other studies indicated that change the patient's position in bed or early mobilization can reduce pain without a statistically significant increase in the incidence of post-diagnostic catheterization complications ([Kusumantoro, 2013](#)). The results of previous studies found that postpositional changes after angiography did not increase the risk of vascular complications, and might make patients feel comfortable ([Vlasic, 2004](#)). Therefore, the

aim of this study was to examine the effect of positioning on bleeding complication and low back pain after diagnostic coronary angiography in patients with coronary heart disease patient in the Integrated Heart Care Center in the Hospital of Dr. Moewardi, Indonesia.

METHODS

Study design

This study was a true-experimental study with randomized posttest-only control group design.

Setting

This study was conducted from January to February 2017 at the Integrated Heart Service Installation of Dr. Moewardi General Hospital.

Research subjects

The target population in this study was all patients with coronary heart disease who performed a diagnostic coronary angiography (post-femoral arterial sheath removal) at the installation of Integrated Heart Service Installation of the General Hospital of Dr. Moewardi, Surakarta, Central Java, Indonesia. Thirty respondents were randomly selected using simple random sampling, which 15 respondents were randomly assigned in the experiment group and control group.

Intervention

The experiment group was given a positioning with 15⁰, 30⁰, 45⁰ head-of-bed elevation in left and right lateral position, and then continued observing arterial bleeding, subcutaneous bleeding (hematoma), and back pain. For pain variable, respondents were given positioning treatment for 6 hours with 6 times the measurement including: posttest 1, posttest 2, posttest 3, posttest 4, posttest 5, and posttest 6. For bleeding complication (arterial and subcutaneous bleeding) variable, respondents

were given positioning treatment for 6 hours with 1 time measurement, which was observed at the posttest at end of treatment. The control group was given a 15-degree head-of-bed elevation based on the hospital standard.

Instrument

There were four instruments used, namely: (i) an arc tool to measure the height of head of bed elevation, (ii) a measuring cup to measure arterial bleeding using, (iii) an instrument to measure subcutaneous bleeding (hematoma) using perforated transparent plastic with 5 cm diameter, and (iv) Numeric Pain Rating Scale in Indonesian language to measure low back pain, in which a respondent selects a whole number (0–10 integers) that best reflects the intensity of his/her pain ([Maharani, Pramono, & Wahyuni, 2017](#)).

Ethical consideration

Ethical clearance has been published by the Health Research Ethics Committee at Dr. Moewardi with number: 17 / I / HREC / 2017. Informed consent was conducted to the respondents by explaining the purpose, benefits, duration of study, procedures responsibilities of participants, and the confidentiality of the data.

Statistical analysis

Kolmogorov- Smirnov and Repeated ANOVA statistical test was used to measure pain.

RESULTS

Table 1 shows that the majority of respondents in the experiment and control group was in the category of elderly (< 45 years), male and in normal category of BMI. There were no significant differences of the characteristics (age, gender, and BMI) between the two groups, which p-value in each variable was >0.05.

Table 1 Characteristics of respondents based on age, gender, body mass index (BMI) in the experiment and control group

Variable	Group				p value
	Experiment (n=15)		Control (n=15)		
	n	%	n	%	
Age (Mean±SD)	(55.33±10.54)		(58.67±13.29)		1.000*
Adult 26-45 years	2	13.3	2	13.3	
Elderly > 45 years	13	86.7	13	86.7	
Total	15	100	15	100	
Gender					0.345*
Male	12	80	13	86.7	
Female	3	20	2	13.3	
Total	15	100	15	100	
BMI (Mean±SD)	(23.54±3.23)		(23.51±2.64)		0.265*
Thin	1	6.7	1	6.7	
Normal	11	73.3	9	60	
Overweight	3	20	5	33.3	
Total	15	100	15	100	

*Lavene's test; Significant $p > 0.05$

Table 2 Arterial and subcutaneous bleeding in the experiment and control group

Variable	Category	Group				p value
		Experiment		Control		
		f	%	F	%	
Arterial Bleeding	No bleeding	13	86.7	12	80	0.345*
	Minimal bleeding (<100ml)	2	13.3	3	20	
	Significant bleeding (>100ml)	0	0	0	0	
	Total	15	100	15	100	
Subcutaneous bleeding (Hematoma)	No hematoma	10	66.7	8	53.3	0.363*
	Small hematoma (≤5cm)	4	26.7	5	33.3	
	Large hematoma (>5cm)	1	6.7	2	13.3	
	Total	15	100	15	100	

*Lavene's test; Significant $p > 0.05$

Table 2 shows that the percentage of arterial hemorrhage in the experiment group was 86.7% of respondents had no bleeding and 13.3% of minimal bleeding, while the control group was 80% of no bleeding and 20% of minimal bleeding. There was no significant difference in arterial bleeding between the two groups with $p=0.345$ (>0.05). For subcutaneous bleeding category, the experiment group experienced small hematoma (27.7%) and large hematoma (6.7%); while the control group experienced

small hematoma (33%) and large hematoma (13.3%). It was no difference in hematoma between the experiment and control group with $p=0.363$.

K-S test result as shown in the table 3 shows no significant effect of positioning on arterial bleeding in the experiment and control group with p-value 1.000 (>0.05); while table 4 also shows no significant effect of positioning on subcutaneous bleeding in the two groups with p-value 0.999 (>0.05).

Table 3 Effect of positioning on arterial bleeding in the experiment and control group using K-S test

Group	Arterial bleeding						ρ value
	No bleeding		Minimal bleeding (<100ml)		Significant bleeding (>100ml)		
	N	%	N	%	N	%	
Experiment	13	86.7	2	13.3	0	0	1.000*
Control	12	80	3	20	0	0	
Total	25	83.3	5	16.7	0	0	

*Kolmogorov-Smirnov: Significant ρ < 0.05

Table 4 Effect of positioning on subcutaneous bleeding in the experiment and control group using K-S test

Group	Subcutaneous bleeding (Hematoma)						ρ value
	No hematoma		Small Hematoma (<5cm)		Large hematoma (>5cm)		
	N	%	N	%	N	%	
Experiment	10	66.7	4	26.7	1	6.7	0.999*
Control	8	53.3	5	33.3	2	13.3	
Total	18	60	9	30	3	10	

*Kolmogorov-Smirnov: Significant ρ < 0.05

Table 5 Differences in low back pain between the experiment and control group

Source	Type III Sum of Squares	Df	Mean Square	F	ρ value
Time of measurement of LBP	12.067	2.386	5.056	4.008	0.017*

* Test of Within-Subjects effects; significant ρ < 0.05

Table 6 Analysis of differences of low back pain between the experiment and control group using repeated measure ANOVA

Low back pain	Group	Mean±SD	ρ value
Posttest 1	Experiment	2.00± 1.414	0.242
	Control	2.73 ± 1.907	
Posttest 2	Experiment	1.33 ± 1.175	0.021*
	Control	2.73 ± 1.870	
Posttest 3	Experiment	1.47 ± 1.407	0.025*
	Control	2.93 ± 1.944	
Posttest 4	Experiment	0.73 ± 1.033	0.000*
	Control	2.93 ± 1.751	
Posttest 5	Experiment	0.40 ± 2.187	0.000*
	Control	3.07 ± 2.083	
Posttest 6	Experiment	0.13 ± 2.326	0.000*
	Control	3.13 ± 2.251	

*Repeated Measure ANOVA; Significant ρ < 0.05

Analysis of the results of Repeated Measure ANOVA (Test of Within-Subjects effects) test on low back pain showed that F value for factor of "LBP measurement time" was statistically different (F 12.067, 2.386 with $p < 0.05$). So, it can be concluded there were significant differences in low back pain between the experiment and control group. The significant difference between the two started from the 2nd hour to 6th hour of intervention with p-value 0.05, thus positioning had a significant effect in reducing low back pain.

DISCUSSION

Effect of positioning on arterial bleeding and hematoma

In this study, post-test observation was done on arterial bleeding and subcutaneous bleeding (hematoma) after giving positioning intervention in the experimental group and noted in the observation sheet. The measurement of arterial bleeding was done using measuring cup, and hematoma was measured using perforated transparent plastic with diameter of 5 cm.

In the positioning procedure during bed rest, the patients were allowed to move freely in bed while the foot attached to the dressing remained straight ([May, Schlosser, & Skytte, 2008](#)). The patients might also alter the position between the supine, tilted to the right or left while keeping the bandaged legs straight ([Chair, Taylor - Piliae, Lam, & Chan, 2003](#); [Yilmaz, Gurgun, & Dramali, 2007](#)). During the bed rest period, the head of the bed might be raised up to 30 degrees ([Reynolds, Waterhouse, & Miller, 2001](#)). Other studies say the bed head can be raised to 45 degrees ([Pooler-Lunse, Barkman, & Bock, 1996](#)).

Femoral artery expulsion as catheter access to diagnostic coronary angiography is the cause of injury to the femoral artery. This can lead to complications of local blood vessels (blood vessels accessing the catheter). This complication does not occur due to the

mechanism of the body against blood clots if there is blood vessels injury ([Heintzen & Strauer, 1998](#)). Previous studies have concluded that there is no significant difference in the incidence of hemorrhage, hematoma and ecchymosis in coronary post-angiographic patients between patients using sand cushions and elastic bandage ([Jones & McCutcheon, 2002](#)). Other studies also concluded there was no significant difference in the incidence of vascular complications (hemorrhage and hematoma) between patients who used a 4.5 kg sand pillow, compressive pads, compression device and without resorting to post-femoral sheath removal in patients post-coronary angiography ([Lehmann, Ferris, & Heath-Lange, 1997](#)).

Diagnostic angiography investigates the openness of the coronary arteries from various aspects to estimate the percentage of vascular artery blocks. The invasive method of action is performed in patients with Coronary Heart Disease (CHD) undergoing diagnostic coronary angiography through access to blood vessels by stabbing in the femoral artery. Trauma occurs in artery walls, with complications such as hemorrhage, hematoma, and distal embolism that are likely to occur in areas where the catheter is inserted. Vascular complications are one of the most common complications of coronary angiography. However, positioning does not increase vascular complications ([Farmanbar, Mohammadiyan, Moghaddamniya, Kazemnejad, & Salari, 2012](#)). Previous studies have also investigated the effect of position changes after coronary angiography. Changing position in bed and using supportive pillows during the early hours after coronary angiography can effectively minimize pain and hemodynamic instability without increasing vascular complications ($p < 0.05$) ([Chair, Fernandez, Lui, Lopez, & Thompson, 2008](#)).

Similar with the results of this study revealed that positioning does not affect the incidence of vascular complications (arterial and subcutaneous bleeding). Changes in position

every hour has been shown not to increase the incidence of bleeding and hematoma, so it can be applied in patient care unit after coronary angiography after femoral sheath is revoked. Because the change in position every hour is proved to improve the patient's comfort, this will certainly improve the welfare of patients during treatment.

Effect of Positioning on Low Back Pain

Physiologically, normal body is a comfortable body without pain, but pain is the physiological response of our body to a stimuli. Pain is needed for our body's defense mechanisms to prevent wider organ or tissue damage caused by pain stimulation ([Guyton & Hall, 2012](#)). Prolonged bed rest causes back muscles weakening and fatigue due to continued pressure to the same muscles continually, whereas muscle fatigue causes muscle spasms and backache ([Yilmaz et al., 2007](#)).

Pain receptors respond to hazard stimuli, such as body position. These receptors are unique because they have an increasingly strong response with repetitive stimulation. Back pain can be directly related to a long-term immobilization period. The muscles that contract statically do not get glucose and oxygen from the blood, so must use the existing reserves. The remains of metabolism cannot be transported out but collected in the muscles. This is what causes pain and fatigue in the muscles. This pain and fatigue force to stop static muscle work. In contrast, dynamic muscle work with the right rhythm will have no muscle fatigue. Back pain often occurs in patients after coronary angiography and this is related to immobility and restricted position ([Pooler-Lunse et al., 1996](#)). Positioning is very important in the cardiovascular system as it can prevent orthostatic hypotension / postural hypotension (decreased blood pressure that occurs suddenly when position is changed from supine to sitting or upright position), increase work of the heart and prevent thrombus ([Perry & Potter, 2005](#)).

Principles in changing position including: the patient is permitted to change position every

hour during the bed rest period, the patient's back and lumbar are supported by the pillow, and the patient is instructed to place three fingers over the femoral dressing to provide pressure when the patient being tilted ([Chair et al., 2008](#)). Position of semi fowler with 30⁰ or 40⁰ head of the bed is very useful for patients who have heart problems to improve comfort, better ventilation, and relaxation.

While lateral position is that the patient lying on the side of the body with the weight supported by the under shoulder, under hip and the upper knee, the upper leg being flexed at the hip. This position helps to reduce pressure on the coccyx and is very useful for patients who spend time in the supine or fowler position and to maintain posture in this position. The patient is mounted a pillow under the head and neck and also under the upper arm ([Kozier, 2008](#)).

Changing position in the bed and reducing the length of bed rest will reduce the patient's back pain, reduce the workload of nursing staff, decrease the length of time for the patient's back massage, decrease analgesic, reduce the length of stay in the hospital so that lower hospitalization costs, and also allow patients to meet self-care needs such as eating, drinking and urination ([Chair et al., 2003](#); [Rezaei - Adaryani, Ahmadi, Mohamadi, & Asghari - Jafarabadi, 2009](#)). This is in line with previous research stating that changing position not only reduces back pain in patients but also increases physical and psychological relaxation ([Chair et al., 2003](#)).

Changing the position in the bed from flat lying down and sitting is generally associated with decreased stress on the back muscles, while a gradual increase in movement will increase flexibility and reduce back muscle spasms. Given positioning, the body pressure point is not only centered on the back, shoulders and pelvis, so that the circulation of blood to the back muscles will be more smoothly and does not cause the buildup of lactic acid. Therefore, positioning according to the procedure is an additional strategy used

to improve patient comfort. Position changes in patients with coronary angiography have a significant effect every hour starting from supine, right tilt and left tilt ([Yilmaz et al., 2007](#)).

The results of previous research indicated that back pain would be worst in line with the length of time of bed rest. Thus, positioning may decrease the intensity of the pain. This is in line with the control group in this study that patients who were not given a change in position tend to experience increased back pain ([Chair et al., 2003](#)). The longer the immobilization, the more discomfort the back pain felt by the patient; the faster the positioning is given, the less likely the complaints of back pain will be ([Chair et al., 2008](#)).

In nursing service, improving the welfare and health status of the patient is the main objective and focus of quality improvement and quality of nursing care performed on each patient who needs treatment in accordance with the status and condition of the patient's health. Given the influence of positioning research (posture changes and head elevation) on these post-diagnostic coronary angiography complications, the nurses in the setting of this study know that post-diagnostic coronary angiography patients should be given a positioning intervention to reduce discomfort safely. This action is an independent act of the nurse as it focuses on the patient's basic needs of getting comfortable and free of pain.

CONCLUSION

It can be concluded that positioning has no effect on the occurrence of arterial and subcutaneous bleeding (hematoma), while positioning has a significant effect in reducing low back pain. It is expected that positioning can be a guideline in patient care after diagnostic coronary angiography, in addition to the routine care of hospital.

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