Review

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Systematic Review: Position Changes After Transfemoral Percutaneous Coronary Intervention

Indriani Merlyn Manueke[1], Yanny Trisyani[1*], Nurlaeci[2]

[1]Faculty of Nursing, Universitas Padjadjaran
[2]RSUP Dr. Hasan Sadikin

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Corresponding email: indriani18004@unpad.ac.id

ABSTRACT
Background. Percutaneous Coronary Intervention (PCI) is the gold standard diagnostic test for Coronary Heart Disease (CHD). To minimize complications after PCI, patient activity is limited to bedrest for 2-24 hours. But the long bedrest can cause complaints of back pain and discomfort. This systematic review aims to identify the position changes in the first 6 hours after PCI for back pain and discomfort.
Metode. Three electronic databases were used to carry out systematic searches namely Pubmed, CINAHL ebsco and ProQuest. The keyword combination is 'percutaneous coronary intervention' AND 'position change' OR 'changing position' OR 'early mobilization' NOT 'Literature Review' OR 'review of the literature' OR 'overview' OR 'Systematic Review' OR 'meta analysis'. The inclusion criteria used were articles with the last 12 years of research 2007 - 2019, quantitative research, English and Indonesian, peer review, randomized controlled trial and quasi experiment. The article search results found 49 articles on CINAHL ebsco, 81 articles on PubMed and 273 articles on ProQuest. A total of 13 articles met the inclusion criteria and were analyzed.
Results. From 13 articles, 6 articles reported a decrease in complaints of back pain and discomfort after changing positions in the first 6 hours in bed. 4 articles indicate the same thing after a change of position made the first 6 hours then walking beside the bed. And 3 articles reported a decrease in complaints of back pain and discomfort after ambulation in the first 6 hours.
Conclusion. Changes in position within a period of 6 hours after PCI can reduce the incidence of back pain and discomfort that is felt by patients.

Introduction

Coronary heart disease (CHD) is still a major health problem in developed and developing countries that have low to moderate income and still the leading cause of death in the world. Even more worrying is that the current heart disease trend is not only suffered by the elderly population, but has also been found at a young age. The percentage of deaths caused by CHD is 31%, the largest among other cardiovascular diseases (WHO, 2017).

The World Health Organization (2017) indicates cardiovascular disease as the leading cause of death worldwide with 17.9 million deaths in 2016 and 85% of deaths occur due to heart attacks and strokes. The American Heart Association (2019) states that CHD remains the number 1 cause of death in the United States with a 13% mortality rate in 2016 or around 363,452 events. 18.2 million people in the United States aged ≥ 20 years suffer from CHD with a higher prevalence in men than women at any age level, namely 7.4% (9.9 million) men and 6.2% (8.8 million) women (Benjamin et al., 2019). European Society of Cardiology (2017) shows statistical data in Europe about cardiovascular disease. 83.4 million people suffer from cardiovascular disease, including peripheral vascular disease (35.7 million) and ischemic heart disease (24.9 million).

In Indonesia, Basic Health Research (2018) shows that as much as 1.5% or 15 out of 1,000 population suffer from CHD and based on sex is higher in women (1.6%) than men (1.3%). Whereas when seen from the highest causes of death, Survey Sample Registration System (2014) showed 12.9% of deaths caused by CHD. The West Java Health Office reported that the number of CHD sufferers in West Java was based on a doctor's diagnosis in 2013, as many as 160 thousand people, and was the most in Indonesia.

Percutaneous Coronary Intervention (PCI) is a non-surgical intervention procedure which is the gold standard for CHD diagnostic tests that provide information about the presence and severity of CHD by using a catheter to dilate or open narrowed coronary arteries due to atherosclerosis or thrombosis using a balloon or stents (Jenita & Pushpakala, 2019; PERKI, 2018).

Post transfemoral PCI, patients are required to bedrest for 2 - 24 hours in the supine position, the head position should not be more than 30°, and the lower extremities of the puncture site must be kept straight and immobile to minimize complications such as hematoma and bleeding due to administration of blood thinning therapy (Abd et al., 2018; Schiks et al, 2008; Chair et al, 2012; Saleh, Abu Sa'aleek, & Nader, 2016; Rezaei-Adaryani, Ahmadi, Mohamadi et al., 2009). However, long bedrest without movement in the supine position can have a negative impact and cause discomfort for most patients, because it will cause complaints such as back pain, fatigue, discomfort, and other complaints (Abd et al., 2018; Rezaei-Adaryani, Ahmadi, Mohamadi et al., 2009; Chair et al, 2012).

This systematic review aims to identify the description of position changes after PCI against back pain and discomfort.

Method

The method used in this systematic review is the full text critical review for the years 2007-2019 in English and Indonesian on the CINAHL Ebsco, PubMed and ProQuest databases. Articles are selected in stages using the PRISMA tool (Preferred Reporting Items for Systematic Reviews and Meta Analyzes). The combination of keywords used is 'percutaneous coronary intervention' AND 'early mobilization' OR 'patient positioning' OR 'effect of position change' NOT 'Literature Review' OR 'review of the literature' OR 'overview' OR 'Systematic Review' OR 'meta analysis'. The research design included randomized controlled trial and quasi experiment. The search process is determined by the inclusion criteria as follows:

1. 2007-2019 research article
2. Research articles in English and Indonesian
3. Quantitative research
4. Open access research articles and full text

While the exclusion criteria, among others, are qualitative research types, published in a

dissertation format or study review such as literature review, concept analysis, systematic review, and meta-analysis.

The article search results found 49 articles on CINAHL ebsco, 81 articles on PubMed and 273 articles on ProQuest. A total of 13 articles met the inclusion criteria and were analyzed. The results of summarizing are explained in the picture by analysis (Figure 1).

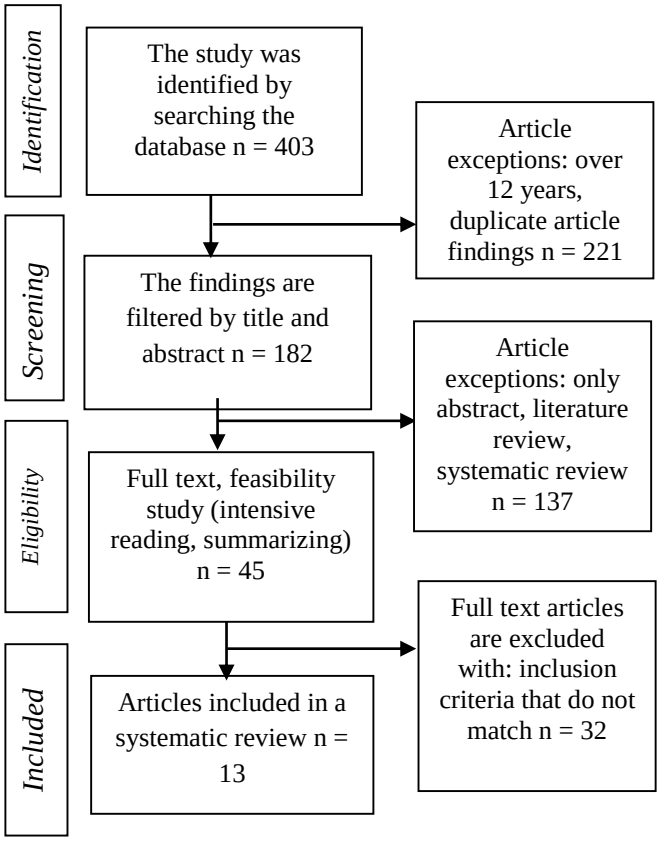

Figure 1. PRISMA Schematic selection process flowchart for a systematic review

Results

Control Risk Of Bias

From 13 studies reviewed, showed a minimal risk of bias because most studies used a randomized control trial (RCT) design.

Research Characteristics

The study was conducted in several countries, namely Turkey (n=1), Iran (n=6), Egypt (n=2), Korea (n=1), Brazil (n=1), Hong Kong (n=1), Surabaya (n=1). The number of study participants included in this review was 1,541 participants with the lowest sample of 20 participants (Harmayetty, Sriyono, & Fajarianto, 2017) and the most was 347 (Augustin, Quadros, & Sarmento-Leite, 2010). The age range of study participants varied from 18 years to 70 years. Participants in the study were post-transfemoral PCI patients.

No.	Title	Researcher and Year	Design	Sample	Aims	Methods	Result
1.	The Effect of Position Change on Vital Signs, Back Pain and, Vascular Complications following Percutaneous Coronary Intervention	(Mert Boğa & Öztekin, 2019) - Turki	RCT	200 (control n=100 & intervention n=100)	To determine the effect of position changes that are applied after percutaneous coronary intervention on vital signs, back pain, and vascular complications.	Patients in the control group were placed in the supine position with a 15° head of bed elevation (HOB) and the patient's leg on the intervention side keep straight. Position changes are applied to patients in the intervention group. - The first 5 minutes (T1), patient was given the supine position and HOB 15^0. - After the first 1 hour (T2) low fowler and HOB positions 15-30^0. - 3 hours later (T3), semi high fowler position and HOB 30-45^0. - After 4 hours (T4), the left or right lateral position and HOB 15^0. - After 5 hours (T5), the low fowler position and HOB 15-30^0. - And after 6 hours (T6), the position of standard fowler and HOB 45-60°	After the procedure is carried out to the intervention group; systolic blood pressure (T4-T6), post procedural vascular complication rate (1%) and significantly lower back pain scores (between T5 and T6) compared to the control group. Back pain at its lowest level in the standard fowler position at sixth hour when the HOB is raised 45-60°. The results for back pain values in group intervention was found statistically significant ($p<0.001$).
2.	Evaluation of feasibility and safety of changing body position after transfemoral angiography: A randomized clinical trial	(Valiee, Fathi, Hadizade, Roshani, & Mahmoodi, 2016) - Iran	RCT	60 (control n=30 & intervensi n-30)	This study aims to examine the effects of changing positions on acute complications of coronary angiography	Patients in the control group, was immobile into the supine position, with head angle of zero degree, 8 hours complete bedrest, and 4 kg sandbags was put on the site where the catheter was inserted for 6 hours. Patients in the intervention group had 8 hours complete bedrest, but changing position were made	The two groups did not show significant differences in terms of demographic, clinical, and pre catheterization intervention characteristics ($P>0.05$). There were no significant differences with respect to vascular complications including hematoma ($P=0.149$), bleeding

						at the 8 hour bedrest. - First and second hours, supine position and head angle of zero degree - Third and fourth hours, the position remains supine with a head angle of 45° - Fifth and sixth hours, patients was lying on their left and right sides with a head angle of 15° - Seventh and eighth hours, patient was care in a sitting position.	(P>0.01), bruising (P = 0.081), and thrombosis in the two groups of patients However, there were statistically significant differences regarding low back pain (P<0.001), groin pain (P<0.001), urinary retention (P=0.02), and comfort (P<0.001).
3.	Effect of Changing Position on Patient Outcomes after Transfemoral Diagnostic Cardiac Catheterization	(Abd et al., 2018) - Mesir	*Quasi experiment*	40 (control n-20 & intervention n=20)	To determine the effect of changing position on back pain, vascular complications (bleeding and hematoma) and patient satisfaction after transfemoral PCI.	In the control group, patient was complete bedrest for 6 hours, the head of the bed no higher than 30° during period of bedrest, and the affected leg kept straight. In the intervention group, 2 hours after the procedure, the patient was given a supine position, after 4th hour, patients rested in a side lying position, and on the 6th hour, patients rested in a semi fowler position. During position changes, supportive devices as small pillow were used to support body parts (head, neck, shoulder, lumbar curvature and between knee), and the leg was maintained straight. Patients were instructed to support the puncture site while turned.	No patient experienced vascular complications (100%). Patients in the intervention group experienced significantly lower back pain intensity than controls after catheterization (p = <0.001). Patient satisfaction also increased statistically significantly compared to controls (p = <0.001).
4.	*Effect of Positioning on Patient Outcomes*	(Bakhshi et al., 2014) – Iran	RCT	80 (control n=40 &	To assess the effect of position changes	In the control group, patient was bedrest in the supine position for 6-24 hours, and	Patients in the intervention group had fewer back pain and leg pain and higher

	After Coronary Angiography: A Single-Blind Randomized Controlled Trial			intervention n=40)	in patients after coronary angiography.	the affected leg kept straight with a sandbag above. In the intervention group, after the patient received a sandbag compress application for 1 hour, and was examined in stages for bleeding for 6 hours. The first 1 hour the patient was given the supine position with HOB 15^0. Then in the first 2 hours, the patient was given the supine position and HOB 30^0. After 3 hours, the patient was given a lateral position opposite to the leg on the intervention side. And from 3rd to 6th hour, patients can replace the position of supine with HOB 30° or lateral.	comfort than the control group at the second, third and sixth hour after catheterization (p = 0.00). There were no significant differences between the two groups in terms of the amount of bleeding and hematoma (p> 0.05).
5.	Modified Left Lateral and Head Elevation Reduces Post Percutaneous Coronary Intervention Back Pain	(Harmayetty, Sriyono, & Fajarianto, 2007) - Surabaya	*Quasi experiment*	20	To identify the effect of modified left lateral position and head elevation on pain reduction after percutaneous coronary intervention (PCI) with vascular closure device.	The intervention was carried out after one hour after PCI with a vascular closure device. Respondents were given a head elevation position for 6 hours and left tilted position 2 times in 6 hours. Data collection is obtained through observation. Respondents were observed with two types of observation sheets namely pain scale observation sheet (Bourbonis pain scale) and distal pulsation sheet (every 15 minutes for 1 hour).	The results showed that there was a significance effect of modified left lateral position and head elevation on reducing back pain with Mann Whitney U test (p=0.00) and there was a significance effect of modified left lateral position and head elevation on the change of dorsalis pedis pulsation with Independent t-Test (p=0.00).
6.	*Effects of position change on lumbar pain and discomfort of Korean patients after invasive*	(Cha & Sok, 2016) - Korea	RCT	48 (control 24 & intervention 24)	This study aims to examine the effect of position changes on lumbar pain and discomfort	In the control group, patients were given a supine position for the first 3 hours with the legs remaining straight after sheath removal. In the intervention group, the first 1	There were significant differences in low back pain and patient discomfort after invasive coronary intervention between the experimental and control

	percutaneous coronary intervention: a RCT study				of patients in Korea after invasive percutaneous coronary intervention.	hour the patient was given a supine position. 1 hour later (2 hours post PCI) lateral position & HOB 30^0. Next hour (after 3 hours), HOB 30^0. 1 hour later, lateral position and HOB 30°	groups.
7.	*The effect of three positioning methods on patient outcomes after cardiac catheterization*	(Rezaei-Adaryani, Ahmadi, Mohamadi, & Asghari-Jafarabadi, 2009) - Iran	*Quasi experiment*	105 (control n=35; intervention 1 n=35; & intervention 2 n-35)	The research aims to investigate the effects of three positioning protocols on back pain, heart rate, blood pressure and vascular complications after cardiac catheterization	In the control group, patients received routine care such as, bedrest 10-24 hours, supine position with leg on the intervention side was immobilized and propped up with a sandbag. Whereas in the 2 experimental groups, the first 1-2 hours, patients were given supine position and HOB 15°. In the third hour, supine position with HOB 30° and hour 4 supine position with HOB 45°. And at 5-6 hours, lateral patient position right and left with HOB 15°. At 7th hour, the patient was given the fowler position. After that the patient is allowed to sit in a chair next to the bed for 10-15 minutes and then walk around and do self-care activities.	The results found the control group experienced a higher level of pain after 3, 6, 8 hours and in the morning after catheterization (P <0.001). The level of pain in group B was also higher than in group A 3 hours after the procedure. Mean heart rate and blood pressure were lower in the experimental group compared with the control group at 6 and 8 hours after catheterization.
8.	*Effect of Early Ambulation; Three versus Five hours after Transfemoral diagnostic Cardiac Catheterization: A randomized clinical One-arm Study*	(Abdelhamed et al., 2015) - Mesir	RCT	164 (control n=74 & intervention n=63)	To investigate the effects of early ambulation; three to five hours after cardiac catheterization through the femoral to vascular complications	The intervention group may ambulate 3 hours after the sheath is removed. During the first 3 hour, position the patient in HOB 45^0. In the control group, the patient ambulated at the fifth hour after the sheath was removed.	There were no statistically significant differences between the two study groups in vascular complications and pain intensity (P> 0.05). There was a statistically significant difference between the two study groups in the occurrence of vascular complications at ambulation and seven days of catheterization.

					and pain levels.		
9.	*Effect of Positioning and Early Ambulation on Coronary Angiography Complications: a Randomized Clinical Trial*	(Abdollahi, Mehranfard, Behnampour & Kordnejad, 2015) – Iran	RCT	140 (control n=35; intervensi 1 n-35; intervensi 2 n=35; intervensi 3 n=35)	This study was designed to assess the effects of changes in position and early ambulation on low back pain, urinary retention, bleeding, and hematoma after cardiac catheterization.	The control group received routine care, 6 hours total bedrest with supine position. In the second group (intervention), 1 hour after coronary angiography, the patient was given supine position with HOB 15°. 2 hours after angiography, supine position with HOB 30°. 3 hours after angiography, supine position with HOB 45°. Then the sandbag was removed, and the patient was removed sleep half hour right tilt and half hour left tilt with angle 15-45°. And 6 hours after the procedure, if there are no complications, the patient is helped to leave the bed slowly. Intervention in the third group is only initial ambulation at the fourth hour and intervention in the fourth group is a change in position and initial ambulation. That is, position change interventions are carried out according to the second group approach and at the end of the fourth hour, if there are no complications; the patient will be helped to leave the bed slowly.	No patient experienced vascular complications. The incidence of urinary retention was higher in the control group, although this difference was not significant. The mean pain intensity at the fourth and sixth hours showed a significant difference (P-0.0001).
10.	*The effect of changing position and early ambulation after cardiac catheterization on patients'*	(Rezaei-Adaryani, Ahmadi, & Asghari-Jafarabadi, 2009) – Iran	RCT	70 (control n=35 & intervensi n=35)	To assess the effect of changes in position and early ambulation on comfort, satisfaction, and	In the control group, patients received routine care such as, bedrest 10-24 hours, supine position with leg on the intervention side immobilized and propped up with a sandbag for about 8 hours.	No patient experienced vascular complications. The incidence of urinary retention was higher in the control group, although this difference was not significant. The mean pain

	outcomes: A single-blind randomized controlled trial				fatigue as well as the amount of bleeding and hematoma after cardiac catheterization.	Whereas in the experimental group, the first 1-2 hours, patients were given the supine position and HOB 15°. In the third hour, supine position with HOB 30° and the 4th hour supine position with HOB 45°. And at 5-6 hours, the patient's position was lateral right and left with HOB 15°. 7 hours after the procedure, patients are allowed to ambulate and perform self care activities.	intensity at the fourth and sixth hours showed a significant difference (P-0.0001).
11.	*Effect of early ambulation after transfemoral cardiac catheterization in Hong Kong: a single-blinded randomized controlled trial*	(Chair et al., 2012) - Hongkong	RCT	137 (control n=74 & intervention n=63)	To investigate the effects of early ambulation after cardiac catheterization (CC) on back pain, area insertion pain, vascular complications, urinary discomfort, perception of general well-being and level of satisfaction.	After bedrest for 4 hours, the experimental group was asked to stand by the bed for 1 minute, then walk indoors for 2 minutes, repeated every hour 3 times, while patients in the control group remained bedrest until the next day,	1 patient in the control group experienced bleeding at the puncture site after CC. Ambulation 4 hours after CC significantly reduced patients' back pain 8 hours after they returned to the unit ($p < 0.001$) and the next morning ($p = 0.023$), discomfort during urination was reduced ($p = 0.03$) and patients who could not urinate ($p = 0.015$). However, there was no significant difference in pain in the insertion area as well as the level of patient satisfaction.
12.	*The Effect of Position Change and Bed-Rest Duration after Coronary Angiography on Vascular Complications*	(Farmanbar, Mohammadiyan, Moghaddamniya, Ehsankazemnejad, & Salari, 2012) - Iran	RCT	130 (control n=65 & intervention n=65)	This study attempts to determine the effect of changing position and duration of bed rest on vascular complications after angiography.	In the intervention group, the first hour the patient slept in the supine position and applied 3 kg of sandbag on the insertion area. 2 hours after angiography, the patient remains supine with HOB 30-45^{O}. After 3 hours, the sandbag is removed and the patient can sleep on his side to the opposite area of the	In the experimental group, bleeding occurred in one of the patients at the fourth hour. It also occurred in one of the patients in the control group immediately after coming to the ward ($p < 0.315$). In the second hour, in the experimental group, a hematoma occurred in one of the patients. It was also

						stabbing site for 30 minutes with a 30-45^{O} HOB with a pillow propped up. At 4 o'clock, if there are no complications, the patient can sit in bed with his feet down for a few minutes, then the patient may walk around the bed for a while, then lie back on the bed. In the control group, the patient slept 8-10 hours without any change in position with a pillow of sand about 4-5 hours.	observed in one patient from the control group during first and second hour (p <0.315). At the fourth hour, two cases of hematoma were observed among patients from the control group (p <0.154). Fisher's exact test proved there was no significant difference between the two groups.
13.	*Early sheath removal and ambulation in patients submitted to percutaneous coronary intervention: A randomised clinical trial*	(Augustin et al., 2010) - Brazil	RCT (control n=175 & intervention n=172)	347	To evaluate sheath release strategies and early ambulation after percutaneous coronary intervention.	The intervention group immediately removed the sheath after the procedure and ambulation after 3 hours of rest. The control group performed sheath release after 4 hours of action and was rested for 6 hours.	The baseline characteristics did not differ statistically between groups, as major bleeding (p = 0.31). Vascular complications and other vasovagal reactions, also no significant difference. Patients in the intervention group had less pain (26% vs 41%, p = 0.004) than the control group, but the frequency of urinary retention was the same in both groups.

Literature review results from 13 articles, and found 3 categories related to position changes in transfemoral percutaneous coronary intervention patients, which will be discussed further in the next section.

Discussion

The study found 3 categories related to position change in post transfemoral percutaneous coronary intervention patients include (1) Position changes in the first 6 hours; (2) Position changes in the first 6 hours then walks and; (3) Ambulation in the first 6 hours. These issues will be discussed in detail below:

1. Changes in Position in the first 6 hours in bed

Changes in bed position in the first 6 hours after PCI can reduce complaints of back pain and discomfort. Mert Boğa & Öztekin (2019) conducted a study on the effects of position changes on vital signs, back pain and vascular complications in 200 post transfemoral PCI patients. In the control group, the patient was placed in the supine position with the patient's leg on the side of the intervention staying straight, not moving and Head of Bed (HOB) 15° in the first 6 hours. The change in position is applied to the intervention group ie, the first 5 minutes (T1) are given a supine position and HOB 15°. After the first 1 hour (T2) the low fowler position and HOB 15-30°. 3 hours later (T3) semi high fowler position and HOB 30-45°. After 4 hours (T4) left or right lateral position and HOB 15°. After 5 hours (T5), low fowler and HOB positions 15-30°. And after 6 hours (T6), the position of standard fowler and HOB 45-60°. The results found a post procedural vascular complication rate (1%) and a significantly reduced back pain complaint (between T5 and T6) compared to the control group. Back pain was at its lowest level in the standard fowler position at 6 hours when the HOB was raised 45-60° ($p < 0.001$).

The study was supported by research conducted by Valiee et al (2016). The study was conducted on patients who will undergo elective PCI. Patients in the control group, bed rest for 8 hours in a supine position and a sandbag (4kg) in the insertion area for 6 hours. Patients in the intervention group, changes in position were made at the 8 hour bedrest. (1) during the first and second hours, supine position; (2) at third and fourth hours, the position remains supine with a head angle of 45°; (3) at fifth and sixth hours, patients can sleep on their left and right sides with a head angle of 15°; (4) at seventh and eighth hours, the patient was treated in a sitting position. The results found there were statistically significant differences regarding low back pain ($P < 0.001$), groin pain ($P < 0.001$), urinary retention ($P = 0.02$), and comfort ($P < 0.001$).

Abd et al (2018) also conducted the same study in 40 patients. The results of the study found that the decrease in back pain was significantly higher than the control after PCI ($p = <0.001$). Patient satisfaction also increased statistically significantly compared to controls ($p = <0.001$).

Similar studies were also conducted by (Cha & Sok (2016) in Korea and Bakhshi et al (2014) in Iran. The results of each study found patients in the intervention group had fewer complaints of back pain, leg pain and had higher comfort than the control group ($p = 0.00$).

Harmayetty et al (2007) also conducted the same study of 20 patients in Surabaya. The results obtained are at the 30 and 60 minutes there is a significant influence from the modification of the left tilt position and head elevation on the reduction in post PCI pain scale with the Mann Whitney U Test statistic ($p = 0,000$).

2. Changes in position in the first 6 hours then walks next to the bed

Rezaei-Adaryani, Ahmadi, Mohamadi, et al (2009) conducted a study in Iran of 105 post-PCI patients. In the control group, patients received routine care such as, bedrest 10-24 hours, supine position with the leg on intervention side was immobilized and propped up with a sandbag. Whereas in the 2 experimental groups, the first

and second hours, patients were given supine position and HOB 15°. In the third hours, supine position with HOB 30° and fourth hour supine position with HOB 45°. And at fifth – sixth hours, patient were given lateral position right and left with HOB 15°. At seventh hour, the patient is given the fowler position. After that the patient is allowed to sit in a chair next to the bed for 10-15 minutes and then walk around and do self-care activities. The results found the control group experienced a higher level of back pain after 3, 6, 8 hours and in the morning after catheterization (P <0.001). The level of back pain in group B was also higher than in group A 3 hours after the procedure. Mean heart rate and blood pressure were lower in the experimental group compared with the control group at 6 and 8 hours after catheterization.

Rezaei-Adaryani, Ahmadi, & Asghari-Jafarabadi (2009) again conducted the same study on 70 post-transfemoral PCI patients. The results of the study were that patients in the experimental group had significantly higher levels of comfort and satisfaction and a lower level of fatigue than the control group at 3, 6, 8 hours and the next morning after catheterization (P <0.01).

The study was supported by Abdollahi et al (2015) who conducted a study of 140 patients. The control group received routine care, i.e. 6 hours total bedrest with supine position. In the second group (intervention), 1 hour after coronary angiography, the patient was given a supine position with HOB 15°. 2 hours after angiography, supine position with HOB 30°. 3 hours after angiography, supine position with HOB 45°. Then the sandbag was removed, and the patient was removed sleep half an hour tilted right and half an hour tilted left with an angle of 15-45°. And 6 hours after the procedure, if there are no complications, the patient is helped to walk beside the bed slowly. Intervention in the third group is only initial ambulation at the fourth hour and intervention in the fourth group is a change in position and initial ambulation. That is, position change interventions are carried out according to the second group approach and at the end of the fourth hour, if there are no complications; the patient will be helped to walk beside the bed slowly. The results found the mean pain intensity at the fourth and sixth hour showed a significant difference (P-0.0001).

Farmanbar et al (2012) conducted a study of 130 post-transfemoral PCI patients. In the control group, the patient slept 8-10 hours without any change in position with a pillow of sand about 4-5 hours. In the intervention group, the first hour the patient slept in the supine position and applied 3 kg of sand cushions on the insertion area. 2 hours after angiography, the patient remains supine with HOB 30-45°. After 3 hours, the sandbag is removed and the patient can sleep on his side to the opposite area of the stabbing site for 30 minutes with a 30-45° HOB with a pillow propped up. At 4th hours, if there are no complications, the patient can sit in bed with his feet down for a few minutes, then the patient may walk around the bed for a while, then lie back on the bed. However, Fisher's exact test proved there was no significant difference between the two groups.

3. Ambulation in the first 6 hours

Augustin et al (2010) conducted a study of 347 post-transfemoral PCI patients. In the control group, sheath was released after 4 hours of PCI and rested for 6 hours. Whereas the intervention group immediately performed sheath removal after the procedure and ambulation after 3 hours of rest. The results found that the intervention group patients had less pain (26% vs 41%, p = 0.004) than the control group, but the frequency of urinary retention was the same in both groups.

Chair et al (2012) conducted the same study in Hong Kong for 137 post-transfemoral PCI patients. After bedrest for 4 hours, the experimental group was asked to stand beside the bed for 1 minute, then walk indoors for 2 minutes, repeated every hour 3 times, while patients in the control group remained bedrest until the next day. The results found 4 hours post PCI ambulation significantly reduced patient's back pain 8 hours after they returned to the unit (p <0.001) and the following morning (p =

0.023), discomfort during urination decreased (p = 0.03).

Previous studies were supported by research conducted by Abdelhamed et al (2015) of 164 patients. In the control group, the patient ambulated at the fifth hour after the sheath was removed. And in the intervention group during the first 3 hours, position the patient HOB 45° and may ambulate 3 hours after the sheath is removed. The results found the mean pain intensity at the fourth and sixth hour showed a significant difference (P = 0.001).

Conclusions

The results of this systematic review show that position changes in the first 6 hours post transfemoral PCI can reduce complaints of back pain and discomfort of patients due to prolonged bedrest. And also position changes in the first 6 hours are safe to do.

Acknowledgments

Not applicable.

Author Contributions

IMM, YT and N conceived the design of the study and drafted the manuscript. YT and N contributed to the implementation of the research and to the analysis of the results. YT and N had substantively revised it. All authors read and approved the final manuscript.

Conflict of Interests

The authors declare that they have no conflicts of interest concerning this article.

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