Original Article

# Effect of changing position and early mobilization on back pain and vascular side effects in patients after coronary angiography

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## Abstract

**Context:** Angiography is associated with vascular complications such as bleeding and hematoma. To prevent these complications, patients are restricted to bed rest in the supine position after the procedure. This practice has been associated with back pain.

**Aims:** This research has been carried out to evaluate the effect of changing position and early mobilization on back pain and vascular side effects in patients after coronary angiography.

**Setting and Design:** This study was a randomized controlled clinical trial conducted in 2016 at Taleghani Hospital, Tehran.

**Materials and Methods:** This study was conducted on 120 patients. Each patient was assigned in groups with simple random allocation to either the control group, which remained the supine position 6 h of bed rest after coronary angiography, or intervention group. The intervention group was changed position hourly, varying between supine, elevated to 30°, and semi position (elevated to 45°) during the first 4 h after coronary angiography. Data collected with demographic questionnaire checklist for complications based on Christnson's Guideline, McGill Pain Questionnaire, and Numeric Pain Intensity Scale.

**Statistical Analysis Used:** All data obtained were analyzed using descriptive statistics (frequency, mean, and standard deviation) and inferential statistics (Chi-square and Mann–Whitney U test).

**Results:** The results showed that the mean pain intensity immediately after entering the postangiographic section in the control groups was $0.9 \pm 0.34$ and in the intervention group was $0.28 \pm 1.22$. There were significantly less pain intensity and extent back pain in the intervention group than the control group ($P < 0.001$). Furthermore, the highest severity of back pain in patients undergoing cardiac angiography in the intervention and control group was $2.43 \pm 1.32$ and $4.88 \pm 1.78$, respectively ($P < 0.001$). None of the patients developed bleeding, hematoma, and arterial thrombosis; therefore, there was no significant difference between the two groups.

**Conclusion:** The recent postcardiac angiography changing position and early mobilization on back pain and vascular side effects in patients without any increase in the vascular side effects may results prevention of back pain and decrease in its extent.

**Keywords:** Back pain, Changing position, Coronary angiography, Mobilization nursing care, Vascular side effects

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**Received:** 27 July 2018; **Accepted:** 23 July 2019; **Published:** 27 December 2019.

| Access this article online | |
|---|---|
| Quick Response Code: | Website: www.jnmsjournal.org |
| | DOI: 10.4103/JNMS.JNMS_22_18 |



**How to cite this article:** Neishabouri M, Haghighi N, Gilvari T, Haghighat S. Effect of changing position and early mobilization on back pain and vascular side effects in patients after coronary angiography. J Nurs Midwifery Sci 2020;7:1-6.

## INTRODUCTION

Cardiovascular diseases are the most prevalent cause of mortality in the world.[1] According to the WHO statistics, cardiovascular diseases still accounted for 30.8% deaths in the United States and every 43 s one person suffers from myocardial infarction (MI)[2,3] and that is anticipated to be the first cause of death in the world till 2030.[4] According to a study in Iran, 50% of all deaths per year and 79% of deaths related to chronic diseases are attributed to cardiovascular diseases in Iran.[5]

There are different diagnostic methods for the assessment of cardiovascular patients that angiography is the most common radical method for the diagnosis of cardiovascular diseases.[2] More than 2 million people in a year in the USA[6] and more than 260,000 in Iran are under diagnostic cardiac catheterization and interventional treatment or both.[7]

In diagnostic and divisional treatment techniques which are done through vessels access complication are common in invasive technique[8] such as death, MI, cerebra vascular accident, cardiac puncture, vascular enlargement, and local cardiac vessels problems.[1,2,9] Bleeding, hematoma and arterial thrombosis, which are the results of arterial trauma at the place of angiography, are among the most important side effects after angiography.[10]

The rate of postangiography side effects has been reported between 0.5% and 13.6% in different researches.[11] In order to prevention of probable side effects, patients must be limited to bed rest and neurovascular of suffering organs area is observed for bleeding and hematoma.[2] The back pain is an inconvenient extra effect for the patients in addition to bleeding and hematoma. The back pain is due to immobility in position change.[12]

In recent years, the methods of angiography nursing care have changed this change leads to increase of patients' comfort and relief and decrease in its postangiography side effects.[12-14] Furthermore, change in patient's bed angles has been studied on pain after coronary angiography by using vital signals. Results showed that patients were placed in bed by angle 45° group have had significantly less back pain than the other groups ($P = 0.001$).[12]

In another study, the effect of early mobilization was studied in patient undergoing coronary angiography on vascular complications and back pain. The results showed that there was a significantly lower rate of perceived back pain in the short immobilization group, compared to the controls, at the time of mobilization, which remained significant also after 2 h of mobilization.[15]

Position and mobilization postangiography study was carried out to assess the comparison of 4.5 h and 2.5 h bed rest on side effects and the rate of patient's comfort. Results showed that no significant difference between two groups considering side effects, but group 2.5 h more comfortable than group 4.5 h ($P = 0.001$).[16]

A lot of studies have been conducted in Iran that can be mentioned to study of changing position on low back pain after angiography, that results showed intervention group have had significantly less back pain than the control groups ($P = 0.001$).[17] Furthermore, in another study, effect of 4 h bed rest was studied on side effects in a patient undergoing coronary angiography on vascular complications and back pain. The results showed no significant difference between two groups considering side effects. There was a significantly lower rate of back pain in intervention group, compared to the controls, which remained 6 h bed rest.[18]

Considering the increasing growth of cardiovascular diseases and the importance of diagnostic methods to reduce the mortality, caring for patients after angiography offers a special responsibility for nurses while the aim of nursing care is increasing comfort and relief of pain without increasing vascular side effects after coronary angiography. Furthermore, while millions of patients are under angiography a year, there is limited research on the change of bed resting position in vascular complications after angiography. Hence, we decided to determine the effect of changing position and early mobilization on back pain and vascular side effects in patients after coronary angiography.

## MATERIALS AND METHODS

### Design study and sampling

This is a randomized, controlled clinical trial registered with IRCT20180723040562N1 at the center for clinical trials and approved by the Ethics Committee of Shaheed Beheshti University of Medical Sciences at (A52/12/114022/19/ 2009). The research environment was the cardiology ward of a general university hospital in Tehran-Iran. Before the study participants signed the consent form of the study. Samples were selected through sampling method available and randomly assigned to intervention and control groups. Hence, using the Cochran formula, the number of 60 samples was calculated as suitable samples in each group.

All participants of the research scheduled 1 day before for nonemergency cardiac angiography through the femoral artery. They were older than 18-year-old with full conscious and the ability for performing the project. The systolic blood pressure was not higher than 190 mmHg or diastolic higher than 110 mmHg. According to the patient's data, they should not have known bleeding disorders, peripheral vascular disease, experiencing back pain before the procedure, allergy to contrast materials, and bleeding after angiography. Furthermore, in this study, exclusion criteria included unwillingness to continue to participate in research, symptoms of allergy to curtain agent, and arrhythmia and the transfer of the patient to the cardiac care unit.

### Method of implementation

The intervention group remained 4 h of bed rest after coronary, also was changed position hourly, varying between supine, elevated to 30° and semi position (elevated to 45°) during the first 4 h after coronary angiography. In every intervention stage, the leg of patients was straight and sandbag was put on dressing in femoral sites. On the semi-supine position, they put a pillow in the waist area. In case of bleeding, the patient put back to the supine position stops his/her bleeding and in the following hours, they did not change his/her position [Table 1].

The cardiac patients were hospitalized at this ward and were under treatment by three different cardiology teams. Following cardiac angiography, hemostasis was achieved at the femoral insertion site through manual pressure by the nurse at cath laboratory. Moreover, dressing was applied to the femoral site and sand bag was put on dressing [Chart 1]. Then, patients were transferred to internal cardiology ward and were under the nursing care for 24 h.

### Tools and methods of data collection

Data collected with demographic questionnaire, Christenson's guidelines Checklist, McGill Pain Questionnaire, and Numeric Pain Intensity Scale. Demographic questionnaire includes information (such as age, sex, height, weight, marital status, and education) and diagnosis at the time of admission, smoking, back pain history, using anti-thrombosis, aspirin and pain medication drugs, prothrombin time (PT), partial thromboplastin time (PTT), International normalized ratio (INR), the time of angiography, and size of catheter and puncture size were collected.

Christenson's guidelines checklist for bleeding and hematoma evaluation were adapted and then developed into an assessment tool for vascular complications.[19] This guidance contains the following factors: insignificant bleeding was defined as blood loss estimated as <100 ml based on Christenson's guidelines. Significant bleeding was defined as blood loss estimated as equal as or >100 ml, which would penetrate the standard pressure dressing used by the cardiology team in the study. Significant hematoma was defined as more than or equal to 5 cm in width. In this research, the diameter of hematoma was measured by ruler. In hematoma with disordered shape, the biggest and smallest hematoma diameter was measured, multiplied 2 diameters and hematoma area was calculated.

### Validity and reliability

Content validity of Christenson's guidelines for bleeding and hematoma was established by a panel of experts, including two nurses that worked in the cath laboratory, a cardiologist who frequently performed coronary angiography. The reliability of the questionnaire was measured by "Interrater Reliability." The checklist was completed at the same time by a researcher and a nurse in 10 patients, Spearman Correlation Coefficient was 0.94 and the Wilcoxon test was 0.54.

Numeric Pain Intensity Scale contained horizontal line and a series of numbers from 0 to 10. Zero shows no pain and number 10 shows the most severe pain. The patient chooses the number, which shows the intensity of pain.[4] Phipps *et al*. introduce the Numeric Pain Intensity Scale as a valid and easy tool to use.[20] The reliability of Numeric Pain Intensity Scale was measured by the spearman correlation coefficient, that it was calculated to be 0.94.

For the assessment of the expansion of back pain, the image from the McGill Pain Questionnaire was used. The expansion of back pain was 0–5 area from inferior chest ribs to hip muscular folds. Interrater reliability by McGill Pain Questionnaire and Numeric Pain Intensity Scale are used [Figure 1]. Five area expansion of back pain the vascular side effects were registered before and

**Table 1: Assessment protocol of changing position early mobilization in intervention and control group patients after coronary angiography**

| | 15 min | 30 min | 45 min | 1 h | 2 h | 3 h | 4 h | 5 h | 6 h | Next morning |
|---|---|---|---|---|---|---|---|---|---|---|
| Positioning | | | | | | | | | | |
| Control | Supine | Supine | Supine | Supine | Supine | Supine | Supine | Supine | Supine | Free |
| Experimental | Supine | Supine | Supine | Supine | 30° | Semi | Supine | Free | Free | Free |
| Intensity of back pain | X | | | | X | | X | | X | X |
| Extension of back pain | | | | | | | X | | X | |
| Vascular (bleeding, heamatoma, pedal pulses) | X | X | X | X | X | X | X | X | X | X |

Use of instruments to evaluate vascular complications and severity and extent of low back pain. X: Control and Cheek

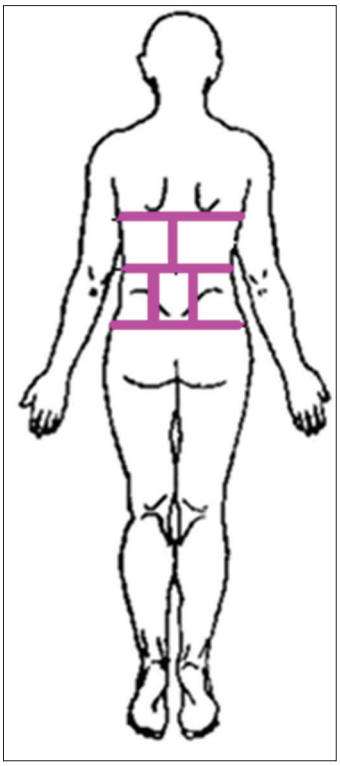

**Figure 1:** Five area expansion of back pain

after angiography on immediate return to the ward, at 1st h every 15 min and then hourly up to 6 h and also in the next morning after angiography. The back pain in both groups was assessed on immediate return to the ward and then after 2, 4, and 6 h following cardiac angiography and the next morning. The interclass correlation coefficient was established at 0.94 for complication.[19]

### Statistical analysis

Data were analyzed using the statistical package for the social sciences SPSS for Windows, Version 16.0 (SPSS Inc., Chicago, USA). Normality of data was determined with Kolmogorov–Smirnov. Descriptive statistics (frequency, mean, and standard deviation) were used for all variables. Demographic data for all patients were compared between the control and intervention groups using *t*-test, Chi-square, and Mann–Whitney U test to determine whether any significant between-group differences.

## RESULTS

Most of the participants in both groups were male (63.3%), from 32 to 75 years (mean 54.3 ± 11.91), married (mean 80%), with body mass index (BMI) normal range (48.5% BMI <25) that was admitted for diagnostic angiography. Most of the participants in both groups reported no history of back pain (83.8%), no smoking (85.4%) and not used anticoagulant drugs (57.7%). According to Table 2 carrying out statistics examinations of *t*-test (age, BMI, PT, PTT, INR), Chi-square (sex, the history of anti-thrombosis drugs usage, smoking, the history of back pain), and Mann–Whitney U (total time for angiography), it was cleared that the participants for research in both groups were matched ($P > 0.05$). Size of the catheter in all cases of angiography was F7.

**Table 2: Comparison demographic data between changing position and early mobilization and control group in patients after coronary angiography**

| Variables | Control group | Intervention group | *P* |
|---|---|---|---|
| Age (years), mean±SD | 56.15±12.20 | 55.49±11.42 | |
| BMI, mean±SD | 25.37±3.00 | 25.38±4.18 | 0.43 |
| PT, mean±SD | 13.01±1.68 | 12.30±3 | 0.11 |
| PTT, mean±SD | 34.79±11.70 | 35.25±22.67 | 0.89 |
| INR, mean±SD | 1.11±0.23 | 1.06±0.31 | 0.32 |
| Sex, *n* (%) | | | |
| Male | 36 (60) | 40 (66.6) | 0.20 |
| Female | 24 (40.0) | 20 (33.4) | |
| Smoking, *n* (%) | 14 (23.3) | 5 (8.3) | 0.08 |
| History of back pain, *n* (%) | 11 (18.3) | 9 (15) | 0.47 |
| Anti-thrombosis drugs, *n* (%) | 32 (49.2) | 23 (36.456) | 0.06 |

SD: Standard deviation, BMI: Body mass index, PT: Prothrombin time, PPT: Partial thromboplastin time, INR: International normalized ratio

In this research, none of the participants had bleeding, hematoma, and thrombosis, there were not significant differences between groups. The results have shown that the highest mean intensity of back pain in control group (4.88 ± 1.78) and in the intervention group (1.74 ± 1.32) on the basis of 0–10 is related to 6th h. Furthermore, the Mann–Whitney U statistics has shown that there is a significant difference in intensity of back pain at 2nd h ($P = 0.03$), 4th h ($P = 0.01$) and 6th h ($P = 0.001$) between the control group and intervention group. It means that intensity of back pain in the intervention group was less than the control group at these times, but it was not significantly different after entering the ward post angiography and the next morning between two groups that means both groups have had the same back pain intensity before the intervention. Meanwhile, none of the patients had any pain when they entered the ward [Figure 1].

Most of the patients in the intervention group (41.6%) had no pain at 6 h, whereas most of the patients in the control group (46.6%) had pain in one area at 6 h after coronary angiography. Furthermore, the extent of back pain was significant between the two groups at 6 h after coronary angiography ($P = 0.01$) [Table 3].

## DISCUSSION

The findings of this research have shown the vascular side effects on patients under cardio angiography in two

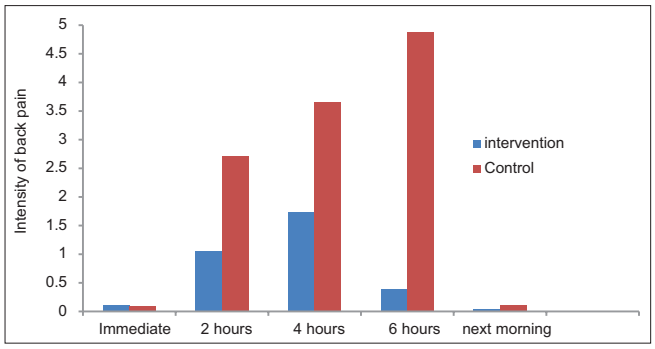


**Chart 1:** Intensity of back pain in 2 groups changing position and early mobilization and control after coronary angiography

**Table 3: Comparison extent of back pain at 6 h after coronary angiography between changing position and early mobilization and control group**

| Extent of back pain | Control group, *n* (%) | Intervention group, *n* (%) | *P* |
|---|---|---|---|
| No pain | 14 (23.3) | 29 (48.3) | 0.01 |
| 1 area | 28 (46.6) | 25 (41.6) | 0.31 |
| 2 area | 10 (16.6) | 4 (6.6) | 0.28 |
| 3 area | 8 (13.3) | 2 (3.3) | 0.24 |

groups (intervention and control) were the same and no significant difference. This research was compared with other researches[12,13,15,16,18] it shows the same results, considering the side effects after angiography at the place of the catheter between control and intervention groups. In a study on patients undergoing angioplasty, 98% of the patients who left the bed 4 h after removing arterial artery had no bleeding.[19] Studies show that since the 1990s, changes in caregivers, such as the use of mechanical pressure tools and skin tools, and the rapid homeostasis, the likelihood of bleeding and vascular complications the likelihood of bleeding and vascular complications have reduced.[21]

The results of the intensity back pain have shown the intensity back pain in the intervention group was less than the control group at 2–6 h after angiography. The result of this research are alike other researches' result in researches.[12,13,15,16,18,22-24] The result of pain intensity in this research, in the next morning after angiography, was opposite to the result of another study.[13,17,18] In this study, no significant difference in the next morning after angiography between two groups was shown, but in contrast with a study that was shown a significant difference was reported.[13] This difference may be due to the long bed rest time of patients (from 8 to 24 h) at that study. A study in 2007 showed that the severity of low back pain was significantly lower in the intervention group at 4 h, 8 h, and 1 day in the intervention group than in the control group.[24] Another study in 2003 reported that the amount of back pain was lower than the control group by increasing the head angle and exit faster from the bed.[16] In a study conducted in 1996, the total perceived pain in the control group was significantly higher than the intervention group. Furthermore, the severity of back pain 3 and 7 h after angiography was significantly lower in the control group with long rest periods in the bed than in the intervention group with a shorter time.[22-24]

Furthermore, the results of the extent back pain have shown the extent of back pain in the intervention group was significantly less than the control group. This may be due to that reducing time in bed has effect on the reduction of expansion of back pain. The result was different to the other result.[17,23,24] In the present study, a significant difference in extent back pain between two groups was shown, but in another study, there was probably no significant difference in the extent of low back pain due to prolonged bed rest (from 6 hours).

The limitations of the study are as follows: (1) The mental and psychological conditions of the studied units are factors that were not under the control of the researcher, (2) pain is a subjective variable that only the patient can determine the amount of that, (3) duration of angiography is variable that was not under the control of the researcher, (4) the pressure dropped by the doctor on the exit site of the kitter was not under the control of the researcher.

## CONCLUSION

To conclude, the result of research has shown that the intensity and extent pain except at the entering time to ward after angiography, and the morning after angiography in changing position and early mobilization group was less than the control group. Finally, according to the results of this research, we can conclude that changing position and early mobilization postangiographic on the basis of the given protocol is safe and possible because it did not cause low back pain. Meanwhile, the nursing care method can reduce the back pain and decrease in pain severity and extent with reducing time in bed and also, because of increasing the rate of body comfort it may reduce the pessimistic idea in patients toward coronary cardio angiography.

### Conflicts of interest

There are no conflicts of interest.

### Authors' contribution

All authors contributed to this research.

### Financial support and sponsorship

The study was supported financially by Nursing and

Midwifery Faculty, Shaheed Beheshti University of Medical Sciences and Health Services. The authors must thank all of the administrators of this university who financially supported the study.

## Acknowledgment

The study was supported financially by Nursing and Midwifery Faculty, Shaheed Beheshti University of Medical Sciences and Health Services. The authors must thank all of the administrators of this university who financially supported the study. Moreover, we are grateful to the participating as well as the administrators of the study setting.

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