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Original Article

Effect of Early Ambulation and Changes in In-bed Position on Back Pain, Comfort, and Vascular Complications After Coronary Angiography: A Single-Blind, Quasi-Experimental Study

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What is already known on this topic?

- *Moving and positioning reduces pain and increases comfort.*
- *Prolonged bed rest is often associated with pain and discomfort for patients.*

What this study adds on this topic?

- *In this study, not only pain reduction and comfort increase were taken into consideration, but also the effect on bleeding-related complications was examined. In addition, 2 different methods were compared.*

ABSTRACT

Objective: This study aimed to determine the effect of early ambulation and changes in in-bed position on back pain, comfort, and vascular complications in patients who underwent femoral angiography.

Methods: This quasi-experimental study was conducted on 135 patients who underwent femoral angiography in the coronary intensive care unit of Artvin State Hospitalbetween March 6, 2023 and August 1, 2023. The sample was divided into 3 groups: control group, position change group (1), and early mobilization group (2). The data were collected using the patient information form, visual analog scale, Immobilization Comfort Scale (ICS), and Bleeding and Hematoma Assessment Form. Pain severity and vascular complications were measured at 0, 2, 4, and 6 hours after angiography. The ICS was measured at 0 and 6 hours after angiography. Data were analyzed with SPSS 23.0 (IBM SPSS Corp.; Armonk, NY, USA) using descriptive and comparative tests.

Results: It was found that there was no significant difference between the descriptive characteristics of the patients ($P > .05$). There was no significant difference in pain levels between the groups at hour 0 ($P > .05$). The pain levels at the second, fourth, and sixth hours were higher in the control group (2.8 ± 1.9, 4.1 ± 2.1, and 6.1 ± 2.5, respectively) than in both intervention groups ($P < .05$). The comfort levels at the sixth hour were significantly higher in the patient groups with position changes and early ambulation than in the control group ($P < .05$). The position changes and early ambulation did not increase the incidence of bleeding and hematoma. While leakage was not observed in both intervention groups after the fourth hour, it was determined that it continued to occur in the control group.

Conclusion: Adjusting bed positioning and encouraging early ambulation after coronary angiography helps reduce the incidence of back pain and vascular complications in patients while increasing comfort levels.

Keywords: Ambulation, back pain, comfort, coronary angiography, hematoma, patient positioning

Introduction

Coronary angiography (CAG) is widely used as a diagnostic and therapeutic tool in treating cardiovascular diseases.[1] It is performed via the brachial, radial, and femoral arteries. Femoral angiography is often preferred over radial and brachial approaches because it allows the use of larger catheters, is easier to perform, reduces radiation exposure, and requires fewer contrast agents.[2]

Manual pressure, pressure with a sandbag, pressure dressings, and strict bed rest are commonly employed after femoral angiography. These practices aim to prevent complications such as femoral artery bleeding, hematoma, arterial thrombosis, and embolism. Prolonged bed rest in a supine position with the head

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elevated at 0-15 degrees and immobilization of the treated leg, besides the appropriate weight of the sandbags, are ensured to reduce the risk of vascular complications post-procedure. This prolonged supine bed rest may cause discomfort for patients, leading to back pain, difficulties with oral intake, prolonged hospital stays, and increased treatment costs. Back pain is one of the most common issues among patients after CAG and is associated with immobility and limited positioning.[3-5]

It is important to prevent complications and ensure comfort after angiography for the patient and the nurse. It is quite difficult to stop bleeding in the procedure area after CAG, and the most common possible complications are bleeding and hematoma formation. Bed rest is considered the safest position after the procedure; however, this position is often uncomfortable for patients.[1]

Previous studies have reported the positive effects of changing the patient's position to reduce pain and vascular complications after CAG. Patients who are gradually moved to a semi-upright position with the head of bed (HOB) elevated experience less pain in the groin, leg, and back. Raising the bed from 15 to 45 degrees and maintaining a semi-upright position has also been shown to improve physiological function.[6] Changing the position of patients after CAG has been demonstrated not to affect the incidence of vascular complications (hematoma, bleeding, and bruising) but to reduce the severity of back pain.[7,8]

Early ambulation and modified positioning effectively reduce back pain in patients who have undergone CAG.[9] Early ambulation 2-4 hours after CAG and changing the patient's position have been reported to reduce back pain.[10] Additionally, previous findings support the effectiveness of intermittent changes in in-bed position in reducing back pain, enhancing physical comfort, and potentially decreasing patients' negative feelings toward the CAG procedure.[11]

The aforementioned findings highlighted the need to compare interventions to prevent back pain, discomfort, and vascular complications after CAG, and determine which intervention was more effective. Therefore, this study was conducted to examine the effects of position changes and early ambulation on patients' pain, comfort, bleeding, and hematoma after CAG.

Hypotheses:

H1: Position changes and early ambulation reduce back pain in patients who have undergone CAG.

H2: Position changes and early ambulation increase comfort in patients who have undergone CAG.

H3: Position changes and early ambulation reduce the development of vascular complications in patients who have undergone CAG.

Methods

Purpose and Type of the Study

This study was designed and conducted as a quasi-experimental research study to determine the effect of early ambulation and position changes on back pain, comfort, and vascular complications in patients after femoral CAG.

Population and Sample of the Study

The study population comprised patients who underwent femoral CAG in the coronary intensive care unit of a public hospital between March 6, 2023, and August 1, 2023.

A power analysis was conducted using the G*Power 3.1.9.4 software package to determine the adequate sample size for the study.[12] A previous study on a similar topic was used as a reference to calculate the effect size.[6] Based on the reference study, the effect size was calculated to be 2.88. This being an extremely large effect size, a smaller effect size was chosen for the present study. For a 2-tailed hypothesis, the minimum required sample size was calculated to be 130 participants with an effect size (*f*) of 0.40, an alpha error probability of 0.05, and a power of 0.95. Additional participants were included to account for potential data loss or dropout of participants. The study was conducted with 135 participants.

Inclusion Criteria for the Study

The inclusion criteria for participants in the study were as follows:

1. Aged 18 years and older
2. Conscious and able to understand Turkish
3. Patients who underwent femoral CAG
4. Vital signs are stable
5. Manual compression technique applied at the entry site
6. No coagulation disorder
7. No hematoma at the femoral access site and no bleeding in the dressing.

Exclusion Criteria for the Study

The exclusion criteria for participants in the study were as follows:

1. History of previous coronary artery stenting
2. Chronic pain, chronic obstructive pulmonary disease, renal failure, or any hypercoagulable state
3. Closure device or sealing device applied after CAG
4. Development of cardiopulmonary resuscitation during CAG
5. Patients experiencing chest pain with femoral artery ruptures and new electrocardiographic changes during CAG.

Data Collection Tools

The data collection form of the study comprised 4 sections. The first section included the patient information form, the second section contained the visual analog scale (VAS), the third section featured the Immobilization Comfort Scale (ICS), and the fourth section comprised the Bleeding and Hematoma Assessment Form, which determined the presence of leakage, bleeding, and hematoma at the dressing site over the femoral artery access area according to the measurement times.

Patient Information Form

This form included 15 sociodemographic and clinical variables, such as the group the patients belonged to, age, gender, body mass index, presence of chronic diseases, platelet counts, pre- and post-procedure international normalized ratio values, pre- and post-procedure hemoglobin levels, vital signs according to measurement times, procedure duration (in minutes), catheter size, and post-procedure analgesic request status.

Visual Analog Scale

Developed by Price et al,[13] VAS was used to measure the intensity of the patient's pain. It was a subjective, unidimensional individual pain assessment scale. The VAS consisted of a horizontal line with a starting point of "0" indicating "no pain" and an endpoint of "10" indicating "unbearable pain." The participants were asked to indicate the number that best represented their pain on a scale from 0 to 10, with the scale explained to them.

Immobilization Comfort Scale

Developed by Kolcaba in 1994, ICS was tested for validity and reliability in Turkish by Tosun et al[14] (2015). The ICS consists of 20 items. Each statement in the questionnaire had a response ranging from 1 to 6; 1 meant "strongly disagree" and 6 meant "strongly agree." The

minimum and maximum total scores on the scale were 20 and 120 points, respectively. The average item score ranged from 1 to 6 and was determined by dividing the total score by the number of items in the questionnaire. The average item score was 1, indicating low comfort and 6, indicating high comfort. In the Turkish adaptation study of the ICS, Cronbach's α value was found to be 0.75 in the first measurement and 0.82 in the second measurement. In this study, it was found to be 0.70 in the first measurement and 0.78 in the second measurement.

Bleeding and Hematoma Assessment Form

This section included measurement results that determined the presence of leakage, bleeding, and hematoma at the dressing site over the femoral artery access area according to the measurement times. The criteria for leakage and bleeding were adapted from the literature reviewed and modified from Black.[5,15] The assessment was designed to measure any blood leakage from the puncture site. Leakage and bleeding were classified using 3 items based on the surface area of the blood-soaked dressing: (0) no bleeding or leakage, (1) leakage (surface area <2 cm^2), or (2) bleeding (surface area ≥2 cm^2). After reviewing the relevant literature, the hematoma assessment was conducted based on the study by Al Sadi et al.[16] Hematoma was determined using 3 items based on the surface area of the blood accumulating under the skin: (0) no hematoma, (1) ecchymosis (surface area <2 cm^2), or (2) hematoma (surface area ≥2 cm^2).[5,10]

Data Collection Process

The patients were divided into 3 groups. The researcher monitored the vital signs of all patients admitted to the coronary intensive care unit at 2-hour intervals and recorded the data from the questions in the first section of the data collection tool.

The days on which angiographies were performed were randomly assigned to the intervention or control group to prevent any interaction between the control and intervention groups in the study. The researcher conducted the interventions and data collection. Hence, the groups were determined based on the days they worked, and patients included in the study on those days were assigned to the same group. The decision regarding which group a particular day would belong to was made by drawing lots. The patients were unaware of their group, ensuring that the study was conducted using a single-blind technique. The researcher who analyzed the data also performed the analysis without knowing which patients were in the control or intervention group. A summary of the data collection process is given in Table 1.

Control Group

No intervention other than the service routine was performed on the patients in the control group. After the diagnostic CAG procedure, the femoral sheath was removed by experienced healthcare professionals for patients who had not received anticoagulants or whose systolic and diastolic blood pressure was below 150/100 mm Hg. The patients were monitored in the supine position before the sheath was removed. Manual pressure was applied to the intervention site, followed by the placement of a weighted bag over the pressure dressing. This area was monitored with the weighted bag in place for 6 hours. The checks for bleeding, leakage, and hematoma were performed every 2 hours until the removal of the weighted bag. The data collected at specified measurement times were recorded in the data collection tool.

Position Change Group (Intervention 1)

After CAG, the researcher changed the patients' positions every 2 hours in the following order: first, a supine position with a 15° HOB elevation, then a semi-Fowler position with a 30° HOB elevation, and finally, a right or left lateral position with a 15° HOB elevation. The data for the patients in this group were recorded in the data collection tool every 2 hours.

Early Mobilization Group (Intervention 2)

After the intervention, patients were provided with 3 hours of complete bed rest. The weighted bag was removed 3 hours after the intervention, allowing the patients to get up. The patients were mobilized around the bed depending on their condition. The data for the patients in this group were recorded in the data collection tool every 2 hours.

Data Evaluation

The data analysis was conducted using Statistical Package for Social Sciences (SPSS) 23.0 (IBM SPSS Corp.; Armonk, NY, USA) software package. Skewness and kurtosis (±1) distribution tests were used to determine the normality of numerical variables. Descriptive statistical methods, including percentages, standard deviation, frequency, and mean, were examined for evaluating the research data. Chi-square tests were used for comparing categorical data, whereas variance analysis was employed for comparing the means of more than 2 groups. Post-hoc analysis was performed to determine which group caused the difference in the ANOVA test. Tukey HSD test was used for this. Repeated measures ANOVA test was used to compare means of 3 or more groups. In ANOVA, Eta squared was examined for effect size. Cohen's *d* was used to measure effect size in independent sample *t*-test and dependent sample *t*-test analyses. A *P* value of < .05 indicated a statistically significant difference.

Table 1. Interventions According to Data Collection Groups

	Control Group	Position Change Group (Intervention 1)	Early Mobilization Group (Intervention 2)
Number of patients	45	45	45
Common interventions	1. Femoral sheath was removed. 2. Manual pressure was applied to the intervention site. 3. A pressure dressing was applied to the intervention site. 4. A weighted bag was placed on top of the pressure dressing.	1. Femoral sheath was removed. 2. Manual pressure was applied to the intervention site. 3. A pressure dressing was applied to the intervention site. 4. A weighted bag was placed on top of the pressure dressing.	1. Femoral sheath was removed. 2. Manual pressure was applied to the intervention site. 3. A pressure dressing was applied to the intervention site. 4. A weighted bag was placed on top of the pressure dressing.
Different interventions	Routine service protocols were followed. No additional interventions were performed. Patients were monitored with a weighted bag in the supine position for 6 hours.	The patient's position was changed every 2 h in the following order: 15° HOB elevation in the supine position during the 0- to 2-hours interval. 30° HOB elevation in the semi-Fowler position during the 3- to 4-hours interval. 15° HOB elevation in the right or left lateral position during the 5- to 6-hours interval.	The weighted bag was removed after 3 hours of complete bed rest, allowing the patient to get up. The patients were mobilized around the bed depending on their condition.

Ethical Principles of the Study

Ethical approval was obtained from the ethics committee of Artvin Çoruh University (number:E-18457941-050.99-80496, date: February 06, 2023) and permission to conduct the study was acquired from the institution where the study was carried out. Before starting the study, the researcher provided information about the research to the patients and obtained their written and verbal consent for participation. The study was conducted following the research and publication ethics and in accordance with the principles of the Helsinki Declaration.

Results

An examination of the age, sex, BMI, presence of chronic diseases, and catheter size used in the control, intervention groups 1 and 2 revealed that the characteristics of the patients in all groups were similar ($P > .05$). However, regarding post-procedure analgesic requests, patients in the control group made a significantly higher number of requests compared with those in the other groups ($P < .05$) (Table 2).

Table 2. Descriptive Characteristics of Patients

	Control[a]		Intervention 1[b]		Intervention 2[c]		
Variable	**n**	**%**	**n**	**%**	**n**	**%**	**Test/*P***
Sex							
Female	10	22.2	12	26.7	14	31.1	X^2: 0.909
Male	35	77.8	33	73.3	31	68.9	*P*: .615
Other chronic diseases							
Yes	30	66.7	21	46.7	26	57.8	X^2: 3.688
No	15	33.3	24	53.3	19	42.2	*P*: .158
Catheter size							
6 Fr	38	84.4	38	84.4	39	86.7	X^2: 0.117
7 Fr	7	15.6	7	15.6	6	13.3	*P*: .943
Post-procedure analgesic request							
Yes	27	60	7	15.6	7	15.6	x^2: 28.023
No	18	40	38	84.4	38	84.4	p: .000 a>b,c
Variable	**x**	**ss**	**x**	**ss**	**x**	**ss**	**Test/*P***
Age	59.9	13.2	57.5	11.8	59.5	11.1	F: .520
							P: .596
BMI	28.7	4.8	28.9	5.6	27.1	4	F: 1.848
							P: .162

BMI, body mass index. a:Control group, b:Intervention 1 group, c:Intervention 2 group.

A comparison of the pain intensity at different time points between the control and intervention groups revealed that the mean VAS score at the zeroth hour was 1.2 ± 1.4, 1.9 ± 1.6, and 1.7 ± 1.6 in the control group, intervention groups 1 and 2, respectively, with no significant difference between the groups (F: 2.191; $P > .05$). A significant difference in pain intensity was found at the second, fourth, and sixth hours between the groups ($P < .05$). Further analysis revealed that the pain intensity in the control group was significantly higher than that in both intervention groups ($P < .05$). Also, the pain intensity in the group with position changes was higher than that in the early ambulation group, but with no significant difference between them ($P > .05$) (Table 3). When pain intensity was examined according to time within the group, pain increased over time in the control group, while it decreased significantly in the intervention groups ($P < .05$). The effect size was found to be similar in both intervention groups ($\eta^2 = 0.4$). The effect size of no intervention on pain intensity in the control group was found to be moderate ($\eta^2 = 0.6$) (Table 3).

A comparison of the mean scores of the ICS at the zero and sixth hours post-procedure for the control and intervention groups revealed that the mean ICS score at the zeroth hour was 70.2 ± 8.9, 72 ± 6, and 71.4 ± 5.9 in the control group, intervention groups 1 and 2, respectively. The analysis revealed no statistically significant differences among the groups (F: 0.717; $P > .05$). The mean ICS score at the sixth hour was 72.8 ± 6.6, 78.7 ± 10.7, and 76.4 ± 3.8 in the control group, intervention groups 1 and 2, respectively. The analysis showed a statistically significant difference among the groups ($P < .05$). The average comfort levels of the patients in the intervention groups were significantly higher than those in the control group (F: 1.830; $P < .05$) (Table 4). When immobilization comfort status was examined according to time within the groups, it was found that comfort increased significantly over time in all 3 groups ($P < .05$), but had a small effect in the control group (Cohen's $d = 0.33$), while position change had a medium-sized effect on comfort (Cohen's $d = 0.77$) and early mobilization had a big effect on comfort (Cohen's $d = 1.00$) (Table 4).

An examination of the occurrence of vascular complications at different hours post-procedure for the control and intervention groups revealed no complications after the fourth hour in the early ambulation group, a significant decrease in the number of patients with complications 2 h post-procedure in the position change group, and an increase in the occurrence of hematoma in the control group up to the sixth hour (Table 5).

Table 3. Comparison of Post-procedure Pain Intensity at Different Time Points Between Control and Intervention Groups

	Control (n = 45)		Intervention 1 (n = 45)		Intervention 2 (n = 45)			
Time Point	**Mean (X)**	**Standard Deviation (SD)**	**Mean (X)**	**Standard Deviation (SD)**	**Mean (X)**	**Standard Deviation (SD)**	**Test**	***P***
Zeroth hour[1]	1.2	1.4	1.9	1.6	1.7	1.6	F: 2.191	*P*: .116
Second hour[2]	2.8[a]	1.9	1.5[b]	1.4	1.4[c]	1.4	F: 12.220	***P*: .000 a > b,c**
Fourth hour[3]	4.1[a]	2.1	0.6[b]	1	0.1[c]	0.4	F: 115.150	***P*: .000 a > b,c**
Sixth hour[4]	6.1[a]	2.5	0.2[b]	0.6	0.0[c]	0.2	F: 248.341	***P*: .000 a > b,c**
Test/*P*	F = 94.317, *P* = .000 $\eta^2 = 0.6$ 4 > 3 > 2 > 1		F = 36.556, *P* = .000 $\eta^2 = 0.4$ 4 < 3 4, 3 < 1 4, 3 < 2		F = 39.246, *P* = .000 $\eta^2 = 0.4$ 4, 3 < 1 4, 3 < 2			

η^2, Eta squared; h, hour; SD, standard deviation. a:Control group, b:Intervention 1 group, c:Intervention 2 group. Those with statistically significant p-values were highlighted in bold.

Table 4. Comparison of Mean Scores of the Immobilization Comfort Scale at the Zeroth and Sixth Hours Post-Procedure for the Control and Intervention Groups

	Control (n = 45)[a]		Intervention 1 (n = 45)[b]		Intervention 2 (n = 45)[c]			
Time Point	**X**	**SD**	**X**	**SD**	**X**	**SD**	**Test**	***P***
Zeroth hour	70.2	8.9	72.0	6.0	71.4	5.9	F: 0.717	*P*: .490
Sixth hour	72.8	6.6	78.7	10.7	76.4	3.8	F: 1.830	*P*: .044 a < b, c
Test/*P*	$t = -6.176$, $P = .000$, Cohen's $d = 0.33$		$t = -2.770$, $P = .008$, Cohen's $d = 0.77$		$t = -5.377$, $P = .000$, Cohen's $d = 1.00$			

SD, standard deviation. a:Control group, b:Intervention 1 group, c:Intervention 2 group.

Discussion

This study aimed to evaluate the effects of early ambulation and position changes on back pain, comfort, and vascular complications in patients undergoing CAG. The findings obtained were as discussed next.

Evaluation and Comparison of Pain Levels (Visual Analog Scale Score Averages) at Different Time Points Post-Procedure in Control and Intervention Groups

In this study, the pain intensity measurement assessed in 135 patients revealed that the VAS values were statistically significantly higher in the control group than in the position change and early ambulation groups at the second, fourth, and sixth hours. A randomized clinical study investigating the effects of position changes and early ambulation on CAG-related complications showed that the average pain intensity at the fourth hour significantly differed among the groups, indicating that changing patients' positions after CAG was safe and facilitated early mobilization.[17] In another study investigating the relationship between position changes, back massage, and early mobility with complications after transfemoral CAG, position changes were performed every 2 hours for the first 6 hours whereas early ambulation was initiated 3 hours after CAG. A majority of patients experiencing severe pain were in the control group, with very few in the position change group.[5] A systematic review investigating the effectiveness of interventions for back pain in patients after transfemoral CAG indicated that early ambulation and modified positioning 2-4 hours after CAG led to a reduction in patients' back pain.[18]

In studies where position was changed, early mobilization was given, and different degrees of bedside position were given, when comparing the zeroth to sixth hours, it was found that pain increased in the control groups and decreased in the intervention groups.[6,11,19,20]

The increase in VAS values with time may be due to patients being supine for an extended period. Prolonged bed rest can lead to weakness in the back muscles, fatigue, and back redness. Also, it can cause spasms and back pain due to constant pressure on the same muscles. Additionally, the duration of the procedure, apart from the patient lying in a supine position after CAG, can also increase the severity of back pain. The literature suggests that, instead of remaining in a prolonged supine position, changing positions and mobilization can reduce tension in the back muscles and alleviate back pain, supporting the findings of the present study. The study observed that the severity of back pain gradually decreased in the experimental groups at the second, fourth, and sixth hours, but the pain severity levels of patients increased over time in the control group, where routine applications were conducted. This validated the research hypothesis, "H1: Position changes and early ambulation provided to patients undergoing CAG reduce back pain."

Table 5. Evaluation of Some Vascular Complications at Different Hours Post-Procedure for the Control and Intervention Groups

	Control (n = 45)		Intervention 1 (n = 45)		Intervention 2 (n = 45)	
Time Point	**n**	**%**	**n**	**%**	**n**	**%**
Zeroth hour						
Leakage	4	8.9	8	17.8	4	8.9
Bleeding	0	0	0	0	0	0
Hematoma	1	2.2	2	4.4	0	0
No complication	40	88.9	35	77.8	41	91.1
Second hour						
Leakage	2	4.4	2	4.4	2	4.4
Bleeding	0	0	0	0	0	0
Hematoma	1	2.2	2	4.4	0	0
No complication	42	93.4	41	91.2	43	95.6
Fourth hour						
Leakage	3	6.7	0	0	0	0
Bleeding	0	0	0	0	0	0
Hematoma	2	4.4	2	4.4	0	0
No complication	40	88.9	43	95.6	45	100
Sixth hour						
Leakage	3	6.7	1	2.2	0	0
Bleeding	0	0	0	0	0	0
Hematoma	3	6.7	2	4.4	0	0
No complication	39	86.6	42	93.4	45	100

Comparison of the Mean Immobilization Comfort Scale Scores at the Zeroth and Sixth Hours Post-Procedure Between Control and Intervention Groups

One of the most commonly used methods to control bleeding in the femoral artery area after CAG is the application of a sandbag.[21] Remaining immobile in the supine position for at least 6 hours post-procedure, along with the added weight of the sandbag, causes back pain. This condition has been observed by clinicians and supported in the literature.[22] Bed rest with the head of the bed completely flat is the standard of care after the procedure. This position is not considered to be the best for patients.[1]

Various studies evaluating the effect of positional changes on patient outcomes after CAG found no difference in comfort levels immediately after CAG, whereas a difference favoring the intervention group emerged after the second hour.[9,22] A study investigating the effect of raising the HOB to 15 degrees on patient comfort after CAG demonstrated that elevating the HOB was not a factor in reducing pain/discomfort.[1] A study aimed at comparing the effects of manual compression and closure pads on the vascular complications of CAG noted that the use of closure pads provided the opportunity for position changes in bed, thus offering advantages such as increased physical comfort for the patient.[23] In the present study, it was seen that comfort increased over time in intervention groups, but the greatest effect was in patients who were mobilized. In a study, patients were subjected to an elevated supine position and back support after angiography. The comfort level was compared between the zeroth and fourth hours. In the comparisons within the groups, the comfort level at the fourth hour after angiography in the control group was significantly lower

than at the zeroth hour ($P < .001$). In the intervention group, comfort increased at the fourth hour after angiography, but it was not found to be statistically significant ($P > .05$).[24] Çıracı et al[25] reported that patients who underwent radial and femoral angiography had higher comfort with radial angiography. Patient comfort is thought to be high because there is positional comfort in radial angiography. Movement is extremely important for overall patient comfort. From the results of the current study, it was thought that movement increased patient comfort because it both changed position and had an effect on reducing patient pain. This finding validated the hypothesis "H2: Positional changes and early mobilization in patients undergoing CAG increase comfort."

Assessment of Vascular Complications at Different Time Points in Control and Intervention Groups Post-Procedure

Development of vascular complications after CAG is essential for all healthcare professionals responsible for the patient's care and treatment, primarily nurses and physicians.[5]

This study demonstrated that changing the patient's position to a 15-30 degrees semi-sitting position and early ambulation after CAG were safe up to 6 hours because no more patients experienced hematoma or bleeding in the intervention groups compared with the control group. High-risk patients were not included in this study due to their risk of developing hematomas or bleeding complications, and therefore, no bleeding complications were observed. Other studies have reported similar results regarding hematoma incidence[7,26,27] and bleeding.[6,26] A randomized controlled study by Bakhshi et al., examining the effects of positioning after CAG on patient outcomes, found no significant effect of position change on the development of vascular complications in the control and intervention groups 2-6 hours later.[9] A meta-analysis study evaluating the effects of the duration of bed rest after transfemoral catheterization on the prevention of vascular complications suggested that patients could walk 2-3 hours after transfemoral catheterization.[28]

In conclusion, the study demonstrated that position change and ambulation did not affect the occurrence of bleeding and hematoma. The difference in the frequency of vascular complications between the groups was thought to be due to the selection of the sheath, specifically the larger 7F catheter. Additionally, it was considered that the need for repeated punctures during angiography and the administration of anticoagulant medication prior to the procedure might have contributed to this. Early ambulation and position changes are not contraindicated in patients whose vital signs are stable and for whom the physician has not recommended bed rest for medical reasons. Patients who do not develop vascular complications can be mobilized early, thereby reducing the negative effects associated with prolonged bed rest and enhancing patient comfort.

Strengths and Limitations of the Study

The current study demonstrated that a simple, free, and safe nursing intervention can effectively improve patients' outcomes after femoral angiography.

The study was limited to patients admitted to the coronary intensive care unit of a hospital who underwent femoral CAG, had sheath removal immediately after the procedure, met the sample selection criteria, and agreed to participate. The study could only be conducted on the days when the researcher worked in the coronary intensive care unit, and processes could not be carried out with other nurses working there. As the researcher was not present in the unit on all days when CAG was performed, patients were not selected according to randomization, and the study was conducted as a quasi-experimental study.

Changing the position of patients and facilitating early ambulation after transfemoral CAG are safe and feasible. They significantly reduce the occurrence of complications such as bleeding, leakage, and back pain 2 hours after CAG while improving patient comfort in the following hours. Moreover, these interventions can help alleviate patients' negative attitudes toward CAG. Furthermore, implementing these interventions prevents nurses from spending time explaining the reasons for patients' complete bed rest, administering pain relief, and massaging the patient's back to alleviate pain. The study recommends in-bed position changes and early ambulation to reduce post-procedural back pain in patients who have undergone CAG, which can also minimize the use of analgesics. Additionally, developing and implementing guidelines and protocols within the unit may further enhance the quality of nursing care and accelerate the recovery process for these patients.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Artvin Çoruh University (Approval No: E-18457941-050.99-80496, Date: February 06, 2023).

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