

# Leg Elevation: As a Nursing Intervention, Can it Reduce Pain after Saphenous Vein Harvest in Patients Undergoing CABG?

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## Abstract

**Background:** Coronary artery bypass graft surgery is an effective method for reducing or eliminating heart angina. Patients undergoing cardiac surgery experience some degree of pain and this problem can't be neglected after surgery. Therefore, we decide to conduct a study with the aim of determining the effect of independent nursing intervention with the leg elevation method by positioning pillow on pain reduction after saphenous vein harvest.

**Method:** This study was carried out on 81 patient candidates for coronary artery bypass grafting (CABG) surgery in Tabriz. Participants were divided into two groups through random blocking with 4 and 6 blocks by following the hiding of the assignment sequence: intervention group (lifting the leg up to 30 degrees), control group (routine cares). The pain score was measured in three stages using the VAS visual scale in the range of 0 to 10 cm. To determine the effect of intervention, one-way analysis of variance (ANOVA) with repeated measurements and ANCOVA tests were used in SPSS 13 software.

**Results:** There was no significant difference between the two groups in the independent t-test in terms of the mean score of pain. Comparison between groups showed a significant difference of the average score pain at the time of leaving ICU and final discharge from ward.

**Conclusion:** The use of leg elevation method at 30 degrees is effective in pain reduction after saphenous vein harvesting.

**Key words:** Coronary artery bypass graft surgery, Leg elevation, Pain

## INTRODUCTION

Cardiovascular diseases have been rising over the past two centuries, among which diseases related to coronary artery is the most common. Despite the advances made in its medical treatment, patients still need vascular reconstruction through surgery (1, 2). Annually, about 686,000 and more than 20,000 open heart surgeries are conducted in the United States and Australia,

respectively. Coronary artery bypass grafting surgery is used as an effective way of reducing or eliminating heart angina (2). This operation is performed using a vein such as a saphenous vein or an artery such as the mammary artery (1). Due to the enough length of the saphenous vein and the ease of the technique necessary to remove graft, it is commonly used in this surgery. To remove the saphenous vein, the surgeon creates a shear in the patient's leg that its complications can cause major problems for the patient. In some studies, the rate of these complications has been reported to be 2 to 24 percent. In another study, including 3525 sample patients with coronary artery bypass grafting, the incidence of complications in a ten-year period was reported to be about 4.2% (3).

Pain is of the most important complications made where saphenous vein is removed. All patients undergoing

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cardiac surgery experience some degree of pain and this problem can't be neglected after the surgery (4). Studies have confirmed that patients with poorly controlled post-operative pain have had heart failure and post-operative infection three and five times more, respectively (5). Due to chest and leg pain, patients undergoing coronary artery bypass grafting surgery may suffer ineffective respiration and motor limitation that leads to the increased risk of developing clots in these patients because of delay in leaving the bed, immobility and stagnation of blood flow (6). Recent studies have revealed that pain in 75% of these patients is not adequately relieved and patients undergoing heart surgery talk about their painful experiences during admission to the intensive care unit (5). Different methods for controlling postoperative pain include systemic treatments (narcotic and non-narcotic drugs), local anesthesia, and complementary and alternative therapies (7, 8). Pain control with systemic drugs, such as morphine, can lead to side effects like respiratory depression, nausea, vomiting, decreased gastrointestinal motility, prolonged hospitalization, and increased hospital costs (9).

Nurses as a main component in health care systems play a key role in maintaining and improving the quality of clinical care and patients' health (10). They also have a significant role in evaluating and controlling the patient's pain during the hospitalization period and constantly needing a decision about measuring and controlling the pain of patients, including decisions about the level of pain and the need for treatment and intervention (11). On the other hand, today, the knowledge level of patients in the field of health care has increased and they are demanding nursing services with a desirable quality. Therefore, nurses need to achieve the skills of promoting cares quality level and to apply them in practice (12); this indicates that nursing interventions play an important role.

However, it seems that due to the effect on the leg edema resulted from removing the saphenous vein, lifting of the leg may initially relieve the pain in this position and decrease the resulted pain (13, 14). Leg elevation helps improve blood circulation which is occurred through reducing the effusion and the accumulation of fluid and edema with an effect on gravity and weight, which is very useful immediately after the surgery. To place the legs at least 30 degrees above the heart level for 10-15 minutes, 3 to 4 times a day, stimulates fluids re-circulation into the circulatory system (15), which results in decreased edema and the pain will mutually reduce, too.

With respect to the limitations made by postoperative pain after coronary artery bypass grafting surgery in patients, a more basic and functional approach should be applied to relief the pain. Considering the ease of

using leg elevation approach and its availability, as well as the many complications and problems resulted from pain medications among patients and due to the lack of research both inside and outside the country in line with the present research we decided to assess the effect of the leg elevation on reducing the pain of the leg among the patients undergoing saphenectomy after the coronary artery bypass graft surgery.

## METHODOLOGY

This randomized controlled clinical trial was performed on patients undergoing coronary artery bypass graft surgery, who were referring to Shahid Madani Educational Center in Tabriz, in order to investigate the effect of leg elevation as a nursing intervention on reducing pain in patients undergoing saphenectomy of the leg.

Due to the lack of similar study with similar variables, a preliminary study with a sample size of each group of 10 subjects was performed to determine the sample size. After the pilot study and taking into account the confidence level of 95%, the test power of 80% and using the G-Power software, the minimum sample size in each group was estimated to be 40 subjects. Finally, in our study, 81 subjects were examined.

Samples were divided into random and control groups using computerized random number table and through blocking with 4 and 6 blocks in the intervention and control group with a 1: 1 allocation ratio. In the random assignment of individuals to the study groups, hiding was followed to avoid the selection bias so that using a computerized random number table the sequence was specified for the needed sample size and placed in the like pockets.

The criteria for entering the study include: CABG surgery candidate, having at least reading and writing literacy, ages 18 to 70 years, lack of motor problems and underlying diseases (renal failure, congestive heart failure, DVT, edema and varice in lower limbs) and not taking oral contraceptive pills. Exclusion criteria consist of the incidence of pulmonary embolism during the study and the refusal to continue to participate in the study.

This study was first approved by Deputy of Research and Technology of the Tabriz Medical Sciences University and the Regional Ethics Committee for Research. Then it was entered IRCT website (IRCT2016051412264N3) and arecommendationletter was received from the Research Deputy of the faculty for the studied center. Subjects were then selected from among all eligible CABG candidate

patients admitted to different wards of Shahid Madani Hospital and informed consent was obtained from them.

Data were collected by a questionnaire including personal information (age, sex, occupation, height, weight, marital status and education). In addition, the information related to the disease (number of blocked veins, graft counts, history of hypertension, and respiratory disease, diabetes, leg vein cramps, heart failure, leg varice, taking contraceptive pills, history of edema in the leg, diuretics use and its type, taking anticoagulant, its type and type of treatment), and the pain visual analogue scale (VAS) was gathered the day before surgery by the researcher. The patient was explained to express the amount of her pain, given that zero on the pain scale indicates “no pain”, and the number 10 represents “very severe pain”. This tool is standard and its validity and reliability have been verified.

The intervention of leg elevation was started after surgery and from the ICU and continued in the surgical section. At rest on bed the patient was told to put the leg, from which graft was taken out, on the positioning pillow. If only one leg gave vein, lifting the leg would be done with a specific pillow on the bed, and if both gave vein, the bottom of the bed would be lifted as much as 30 degrees. The control group did not receive any intervention other than routine care and the patient’s leg was placed in a flat position according to the section routine.

Pain information was re-collected at designated times, i.e. leaving the ICU and discharge from the section. After final data collection, while discharge, both patients were trained benefits of keeping their leg up during bed rest and sleeping.

Data was finally entered into SPSS software and analyzed by statistical t-test, ANOVA with repeated measures, ANCOVA and follow up tests. The basis of significance was determined to be  $P \leq 0.05$ .

## FINDINGS

81 patients were randomly studied in the research as two groups of intervention (40 patients) and control (41 patients). participants age range was between 18 and 73, with an average of 57 years. The mean weight in the intervention group was  $77.75 \pm 12.37$  kg and in the control group was  $84.54 \pm 15.65$  kg. The majority of participants in both groups was married and had elementary education. 45% of the subjects in the intervention group and 65.85% of the patients in the control group were taking anticoagulant. Among the subjects in the intervention

and control groups respectively 87.5% and 92.68% of the patients had undergone angiography. 35.5% of the subjects in the intervention group and 19.5% of the subjects in the control group had diabetes history. 45% of the subjects in the intervention group had two grafts and 46.34% of the subjects in the control group had three grafts.

According to Table 1, there was no statistical difference between the groups in terms of social- personal characteristics and the two groups were similar.

The results of within group comparisons of right leg pain at different times by analysis of variance (ANOVA) with repeated measures showed that there was a significant difference in the intervention group unlike the control group before and after the intervention ( $P = 0.05$ ) (Table 2). The results of follow up tests in the intervention group revealed that there was a significant difference between the mean pain only at the time of discharge from the ICU and the final discharge ( $P = 0.02$ ).

Although there was no significant difference between the two groups in the mean pain before surgery and the two groups were similar ( $P = 0.35$ ), the results of between groups comparison using ANCOVA showed that statistical significant difference in the mean pain between the two groups was observed at the time of discharge from the section ( $P = 0.008$ ) (Diagram 1).

The findings of this study for left leg pain within the groups were compared by statistical analysis of variance with repeated measures. The result of this test suggest that in the intervention group, in contrast to the control group, there was a significant statistical difference before and after the intervention ( $P = 0.03$ ) (Table 3). Moreover, the follow up test results showed that the mean pain was significantly different in the intervention group in the interval of pre-operation and discharge from ICU ( $P = 0.05$ ), and discharge from ICU as well as final discharge ( $P = 0.02$ ).

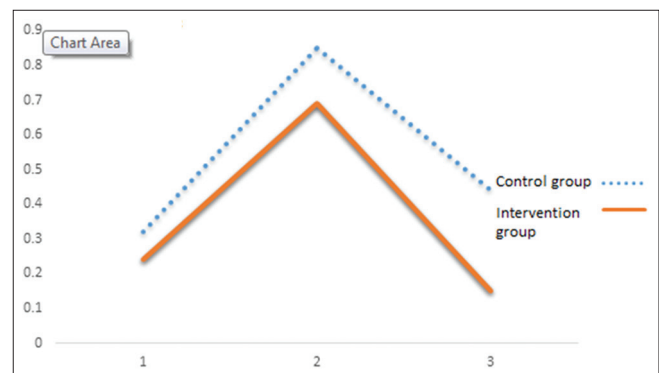


Diagram 1: The mean pain of right leg in the studied groups at different times

**Table 1: Socio-demographic characteristics**

Variables	N (%)		Statistical Indicators		
	Intervention group	Control group	Test	df	P
Occupation					
Unemployed	2 (5)	2 (4.87)	X <sup>2</sup> = 5.85	3	0.87
Employed	1 (2.5)	6 (14.63)			
Free job	32 (80)	24 (58.53)			
Housewife	5 (12.5)	9 (21.95)			
Graft counts					
1	12 (30)	8 (19.51)	X <sup>2</sup> = 9.56	3	0.01*
2	18 (45)	9 (21.95)			
3	8 (20)	19 (46.34)			
More than 4	2 (5)	5 (12.19)			
The number of blocked vessels					
1	3 (7.5)	5 (12.19)	X <sup>2</sup> = 1.9	2	0.80
2	14 (35)	9 (21.95)			
3	23 (57.5)	27 (65.85)			
The history of hypertension					
Yes	21 (52.5)	22 (53.65)	X <sup>2</sup> = 0.01	1	1
No	19 (47.5)	19 (46.34)			
The History of respiratory disease					
Yes	4 (10)	6 (14.63)	X <sup>2</sup> = 0.4	1	0.74
No	36 (90)	35 (85.36)			
History of diabetes					
Yes	14 (35)	8 (19.51)	X <sup>2</sup> = 2.46	1	0.13
No	26 (65)	33 (80.48)			
History of legvessel cramp					
Yes	3 (7.5)	4 (9.75)	X <sup>2</sup> = 0.13	1	1
No	37 (92.5)	37 (90.24)			
Smoking history					
Yes	19 (47.5)	15 (36.58)	X <sup>2</sup> =0.99	1	0.37
No	21 (52.5)	26 (41)			

**Table 2: Mean pain of right leg in the studied groups at different times**

Time group	(Mean±SD)			Test result
	Before surgery	Discharge from ICU	Final discharge	
Intervention group	0.36±1.13	0.73±1.60	0.15±0.66	f=3.35 df=2 P=0.05
Control group	0.18±0.64	0.6±1.60	0.63±1.5	
Test result	t=0.95 df=79 P=0.35	f=0.05 df=1 P=0.83	f=7.41 df=1 P=0.008	P=0.063

**Table 3: Mean pain of left leg in the studied groups at different times**

Time group	(Mean±SD)			Test result
	Before surgery	Discharge from ICU	Final discharge	
Intervention group	0.24±0.85	0.69±1.51	0.15±0.66	f=4.790 df=2 P=0.03
Control group	0.32±1.11	0.85±1.93	0.44±1.38	
Test result	f=0.362 df=79 P=0.71	f=0.102 df=1 P=0.750	f=1.150 df=1 P=0.224	f=2.680 df=2 P=0.08

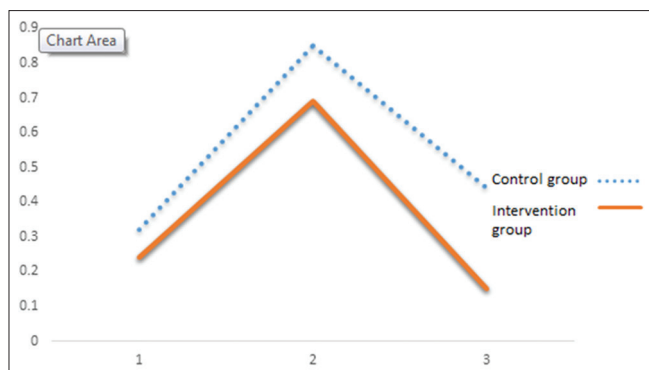
In the intervention group, there was a statistically meaningful difference between the mean pain of the left leg before surgery and the time of discharge from the ICU and discharge from the section, but there was no significant difference in the control group. However, the mean pain in both groups increased compared to the preoperative pain; though, this increase in the control group was significantly higher than the intervention group during the period. However, the results of between groups comparison by covariance analysis test (ANCOVA) showed that no significant difference was observed

between the two intervention and control groups at any time (Diagram 2).

## DISCUSSION

assessment of pain as a mental symptom is very difficult because it is a multidimensional problem and affects both the body and the mind. The response to pain in different people varies according to personality,





**Diagram 2: The mean pain of left leg in the studied groups at different times**

family and cultural differences. Individual response to pain is characterized by physiological and behavioral manifestations. Psychosocial-social factors such as age, environment and history of previous pain can affect the experience of the individuals' pain. Environmental factors such as the duration of the procedure, room temperature degree, noise and the patient's position may affect the pain (16).

The findings of the present study showed that the mean pain in both groups at the time of discharge from ICU was at the maximum level but there was no significant difference between the two groups. In the intervention group, the mean pain reduction started from the time of leaving the ICU and reached the highest level at the time of discharge from the hospital. There was a further decline in the mean pain in the intervention group than the control group.

Goldsborough et al. (1999) conducted a study with the aim of investigating the prevalence of leg ulcer complications after coronary artery bypass graft surgery. Their findings proved that the incidence of complications in these patients was 6.8%. Patients with complications, in 84% of cases, showed localized redness, 59% tenderness, 57% heat in the graft place, 54% drainage and 27% of them reflected stiffness (12). Although their study is not directly related to the current research, it shows that pain is one of the symptoms and complications of discomfort among patients after CABG that greatly decreases over the time and with the withdrawal of fluid from the interstitial space. The use of nursing interventions such as giving position and positioning pillows increases evacuation of the leg veins and reduces edema and the pain caused by it.

In the review of the literature, unfortunately, there was no study inside or outside the country to assess the effect of elevation on the leg pain after saphenectomy,

## CONCLUSION

According to these results, the researcher concludes that independent nursing intervention can be effective in preventing or reducing the physical complications and in improving the comfort of patients after coronary artery bypass grafting surgery, and considering its ease of use and since it is non-invasive, this method can replace or supplement many of the therapeutic or aggressive therapies to eliminate edema and pain of legs. It is also has a significant effect in the decrease of treatment costs and the hospitalization duration. Regarding the role of nurses in the bedside, in order to prevent complications following the operation, the results of this study can help the team members (physician and nurse) to provide and select an inexpensive, accessible and convenient method to reduce the complications of saphenectomy, to decrease pain and edema and to prevent DVT and lead to the improvement of the quality of the care provided. The results of this study can also be used as the complementary of previous research and as the basic information in future research.

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## Baluje, *et al.*: Leg Elevation: As a Nursing Intervention

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