Effect of Leg Maneuver Exercises on Orthostatic Hypotension among Postoperative Patients

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Abstract:

Background: Among patients recovering from surgery, orthostatic hypotension related to posture is by far the most common cause of transient unconsciousness. A leg maneuver is thought to be a straightforward technique to prevent or reduce its responses. **Aim:** Was to investigate the effect of leg maneuver exercises (leg elevation, thigh muscle contraction, leg crossing and contraction) on orthostatic hypotension among postoperative patients. **Design:** A quasi-experimental (pretest/posttest nonequivalent control group design was used. **Setting:** This study was conducted in the general surgical departments at Kasr Al-Aini Hospital, affiliated with Cairo University. **Sample:** A purposive sample of 60 adult male and female postoperative patients undergone general abdominal surgery; and who had no neurological or vascular disorders were enrolled in the current study over six consecutive months. **Tools:** Three tools were used: First, Personal and Medical Data Form; Second, Hemodynamic Parameters Checklist; and the third, Orthostatic Hypotension Questionnaire (OHQ). **Results:** There was a statistically significant difference between the study and control groups related heart rate mean scores on the second and third-day post leg maneuver exercise after three minutes of standing position (P=.001) (P=.012) respectively. As well, there was a highly statistically significant difference between the study and control groups related systolic blood pressure after leg maneuver exercise over readings (P=.000) (P=.051) and diastolic blood pressure (P=.003) (P=.050) respectively. Furthermore, there was a highly statistically significant difference between the study and control groups in relation to orthostatic hypotension related symptoms post leg maneuver exercise at the first day (P=.003) and also at the third day (P=.000). **Conclusion:** Leg maneuver exercises have a significant effect in improving patients' hemodynamic parameters (blood pressure & heart rate), and preventing orthostatic hypotension related manifestations. **Recommendation**: Leg maneuver should be recommended as the first-step management of patients suffering from orthostatic hypotension postoperatively.

Key words: leg maneuver exercises, orthostatic hypotension, postoperative patients.

Introduction

The total number of surgical procedures performed worldwide is significant increased and continues to grow each year; these numbers represent 300 million surgeries in 2012 and 310 million in 2020 (Dobson, 2020). Nowadays; postoperative early mobilization of patients has been widely practiced and considered as the crucial approach in prevention of postoperative morbidity and decreasing hospital length-of-stay. On the other hand, early postoperative mobilization can be delayed due to postoperative orthostatic hypotension (POH) which defined as a fall in systolic pressure > 20 mmHg and/or diastolic pressure > 10 mmHg or due to postoperative orthostatic intolerance (POI), characterized by dizziness, nausea, vomiting, blurred vision or syncope during setting or standing (Jans & Kehlet, 2017).

Surgical patient postoperatively can exhibit orthostatic hypotension (OH) secondary to temporary non-neurogenic factors such as: anesthesia; blood loss; dehydration; treatment with certain drugs and bedrest for an extended period of time. The most common drugs used are vasodilators, antihypertensive agents, diuretics, antidepressants, and opioids. Immediate postoperatively patients may often receive one or more of these drugs. All of these factors can contribute to a higher incidence of hypotensive symptoms when first mobilizing. Orthostatic hypotensive episodes can potentially lead to an increased risk for falls, reduced patient satisfaction, and delayed discharge (Tzur, Izhakian & Gorelik, 2019; Livesay & Peyton, 2021).

Non-neurogenic OH is due to an excessive fall in cardiac output, and compensatory mechanisms are not adequate to restore drop of blood pressure, or by a decrease in cardiac output accompanied with mild or transient impairment of vasoconstrictor compensatory mechanisms (Tzur, Izhakian & Gorelik, 2019) Several prospective studies of major surgery have described that orthostatic hypotension and orthostatic intolerance are common problems postoperatively during early mobilization, with a prevalence of 42-50% (Kehlet & Henrik, 2022). Although relatively little data are available regarding OH mechanism and possible treatment; it is associated with an increased risk of postoperative morbidity (Jans & Kehlet, 2017).

There are pharmacologic and non-pharmacologic approaches for treatment of OH aimed to reducing the symptoms, mainly the falls, increase the standing time, improve early mobilization and consequently enhance the activities of daily living. The non-pharmacologic approach is aimed at optimizing blood volume, decreasing postural venous pooling, reducing heat and post-prandial induced vasodilation, emphasizing physical conditioning. Most of non-pharmacologic measures are combined as leg maneuver exercises that designed to increase venous return by reducing peripheral capacitance and increasing total peripheral resistance and mainly involving leg elevation, thigh muscle contraction, leg crossing and contraction (Chelimsky & Chelimsky, 2020).

Nurses are the key member of the health team who interact with surgical patients postoperatively so, they are ideally positioned to monitor for signs and symptoms of orthostatic hypotension and be aware of different non pharmacological measures to enhance physical state of patients. Recognition of these patients for OH symptoms can facilitate more efficient diagnosis and management early which by consequently optimize patient safety, reduce hospital stay and return patients to normal activities (Biswas, Karabin & Turner, 2019; Livesay & Peyton, 2021). Therefore, the aim of the current study is to investigate the effect of leg maneuver exercises (leg elevation, thigh muscle contraction, leg crossing and contraction) on orthostatic hypotension among surgical Patients postoperatively.

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Significance of the Study

Worldwide, incredible 310 million major surgeries are undertaken every year; around 40 to 50 million in USA and 20 million in Europe (Dobson, 2020). The total prevalence of OH ranges from 14.8% to 56%. In patients with diabetes orthostatic hypotension (OH) is a major clinical sign of cardiovascular dysautonomia and affects between 5% and 30% of all individuals in an age-dependent manner (Zhou, Ke, Qiu & Liu, 2017). Prospective studies of major surgery have reported that orthostatic intolerance (OI) is a common problem during early postoperative mobilization, with a prevalence of 42-50%. Retrospective studies with less well-defined mobilization protocols have reported an OI prevalence in the range of 12-60% across surgical procedures (Jans, Henrik & Kehlet, 2016).

Additionally (Hanada, et-al., 2017) when study the incidence of orthostatic hypotension and cardiovascular response to postoperative early mobilization in patients undergoing cardiothoracic and abdominal surgery reported that, orthostatic hypotension was observed in 191 (39%) out of 495 patients. The incidence of OH in cardiac, thoracic, and abdominal surgery groups was 39 (33%) out of 119; 95 (46%) out of 208, and 57 (34%) out of 168 patients respectively.

Reviews approved postoperative orthostatic hypotension (POH) occurring on the remaining day of surgery and within the first four days after surgery was significantly associated with an increased risk of the primary outcome. Furthermore, when signs and symptoms of orthostatic hypotension appear; a reduction in blood flow (hypoperfusion) to tissues, particularly the brain occur. Affected patients may have fatigue, confusion, dizziness, blurred vision, or fainting episodes (syncope) (Hoppe, Kouz & Saugel, 2020). Besides, Leg maneuver exercises are simple, safe and costless in addition to its effect on reducing venous pooling; increases total peripheral resistance and enhances venous return to the heart. So, the researchers aimed to investigate the effectiveness of these exercises on orthostatic hypotension hoping the finding of this study establish an evidence data that enhance patient quality of care and consequently improve patient health status and their activities.

Aim of the study

The aim of the current study was to investigate the effect of leg maneuver exercises (leg elevation, thigh muscle contraction, leg crossing and contraction) on orthostatic hypotension among postoperative patients.

Research Hypotheses

H1: The total mean score of blood pressure reading among the study group who practice leg maneuver exercises will differ from the control group who receive routine hospital care only.

H2: The total mean score of heart rate reading among the study group who practice leg maneuver exercises will differ from the control group who receive routine hospital care only.

H3: The total mean score of orthostatic hypotension symptom assessment among the study group who practice leg maneuver exercises will differ from the control group who receive routine hospital care only.

Operational Definitions:

Leg maneuver exercises: Is the patient practice of certain type of leg movements including leg elevation, thigh muscle contraction, leg crossing and contraction for a 30 second at a time for each type of exercise before change patient's position from lying to standing position.

Orthostatic hypotension: Is a drop in systolic blood pressure of at least 20 mmHg or a drop in diastolic blood pressure of at least 10 mmHg within 3 min upon standing from sitting or lying position of postoperative patient or increase of heart rate above 30 beat /minute than the base line reading and associated with dizziness, nausea and vomiting during mobilization; which measured by blood pressure and heart rate readings and Orthostatic Hypotension Questionnaire (OHQ).

Methods

Research Design: A quasi-experimental design (pretest/posttest nonequivalent control group) was used. It is a method for assessing the effect of an intervention by comparing scores on a variable before and after an intervention (Gray, Grove, Sutherland, & Burn, 2017). A pretest/posttest nonequivalent control group design was used in the current study to estimate the effect of leg maneuver exercises on orthostatic hypertension postoperatively.

Setting: The study was conducted in the general surgical departments in the first and second floor; providing preoperative and postoperative care for all surgical patients at Kasr Al-Aini Hospital, affiliated with Cairo University.

Sample: A purposive sample of 60 adult male and female postoperative patients through six consecutive months; undergone general abdominal surgery; their age starts from 18 years old were enrolled in the current study and were divided randomly into the study and control groups (30 patients each). Patients who had neurological or vascular disorders were excluded.

Tools:

The following three tools were used to gather data related to the current study:

I. Personal and Medical Data Form: It was developed by the researchers and consists of two parts: part one personal data covering information related to age, gender, marital status, occupation and level of education. Second part: the medical data, it includes questions related to type of surgery, time of surgery, type of anesthesia, associate diseases, and BMI. (National Institute of Health, BMI., 2023).

II. Hemodynamic Parameters Checklist: It was designed by the researchers guided by American Heart Association (2023) to measure and record the selected vital signs (heart rate, systolic, and diastolic blood pressure) of the study sample during lying position and after 1and 3 minutes from standing position for the first three consecutive days postoperatively.

III. Orthostatic Hypotension Questionnaire (OHQ): It is a self-reporting instrument developed by Kaufmann, Malamut, Norcliffe-Kaufmann, Rosa, and Freeman (2012), The questionnaire is divided into two separate parts: Part one, Orthostatic Hypotension Symptom Assessment (OHSA), while part two focused on Orthostatic Hypotension Daily Activity Scale (OHDAS), this questionnaire is a valid and reliable tool with high internal consistency as (Cronbach's alpha 0.88) (Frith & Newton, 2016). According to the aim of the current study the researchers adopted the first part of the Questionnaire which is Orthostatic Hypotension Symptom Assessment (OHSA). It consisted of six questions, related to 1- Dizziness, lightheadedness, feeling faint, or feeling like you might black out; 2- Problems with vision (blurring, seeing spots, tunnel vision, etc.); 3- Generalized weakness; 4- Fatigue; 5- Trouble concentrating; and 6- Head/neck discomfort) The items are scored on 11-point scale from zero to 10, with zero indicating no symptoms and 10 indicating the worst possible symptoms. Content validity was assured by three medical surgical experts and its reliability was excellent as (Cronbach's Alpha = 0.94).

Ethical Considerations

An official approval was obtained from the Research Ethics Committee at Faculty of Nursing, Cairo University (IRB: 2019041701). All participants were provided with information forms detailing the aim; significance; and process of the study. They were also be given the opportunity to ask questions about the research; and was fully assured that they can withdraw from the study at any time without any negative consequences. Participant's informed consent was obtained prior to beginning of data collection. Anonymity and confidentiality of the collected data was assured through coding as well as keeping the documents in a safe locked place.

Procedure

Once obtaining the formal approval from the research ethics committee and the surgical department director; the researchers interviewed each patient who met the inclusion criteria individually preoperatively (the day before surgery) to explain the nature and purpose of the study. After that each patient was asked to sign a consent form and baseline data was collected from both the study and the control groups (who receiving the same routine hospital care) using tool I to collect personal and medical data, followed by tool II (Hemodynamic parameters Checklist) to measure and record systolic and diastolic blood pressure in addition to heart rate. Then the researchers divided the subjects randomly into control and study groups. First day postoperatively data were collected from the control group firstly by the researches to avoid contamination. After that the researcher were teach each patient in the study group to practice leg maneuver exercises (leg elevation, thigh muscle contraction, leg crossing and contraction) for a 30 second for each type of exercise before change position from laying to standing position for three consecutive days while the control group were receiving the routine hospital care only as (Fluids and electrolyte replacement; pain control; wound care). Subsequently, selected Hemodynamic parameters as (heart rate, systolic and diastolic blood pressure) were measured for both study and control groups at lying position then after one minute and three minutes of standing position for three consecutive days at the morning shift using tool II followed by assessing orthostatic hypotension related symptoms at the first and third day postoperatively using tool III.

Statistical Analysis

The collected data were tabulated, computed, and analyzed using the Statistical Package for Social Science (SPSS) version 20 (Social Science, IBM, USA, 2020). Data were presented using descriptive statistics in the form of frequencies, percentages, mean and SD as well inferential tests as independent T-test; paired T-test; Anova and $\chi 2$ test. Statistical significance was considered at P value less than or equal to 0.05.

Results:

Table (1): Frequencies and percentages distribution of personal characteristics among the study and control groups (N= 60)

Variables	Study group (N=30)		Control group (N=30)		χ^2	P- value
	No.	%	No.	%		
Age:						
- 18 < 30	9	30.0	8	26.7	**4.43**	**0.88**
- 30 < 40	12	40.0	9	30.0		
- 40 < 50	6	20.0	7	23.3		
- 50 ≤ 60	3	10.0	6	20.0		
Gender:						
Male	19	63.3	17	56.7	**0.34**	**0.55**
Female	11	36.7	13	43.3		
Marital status						
Single	5	16.7	4	13.3	**1.52**	**0.82**
Married	23	76.7	23	76.7		
Divorced	2	6.7	3	10.0		
Level of education:						
Cannot read and write	16	53.3	14	46.7	**15.82**	**0.46**
Primary school	1	3.3	3	10.0		
Preparatory school	4	13.3	4	13.3		
Secondary school	6	20.0	6	20.0		
University	3	10.0	3	10.0		
Residence:						
Urban	26	86.7	27	90.0	**1.15**	**0.28**
Rural	4	13.3	3	10.0		
Occupation:						
Worker	13	43.3	12	40.0	**9.97**	**0.35**
Farmer	3	10.0	2	6.7		
Employee	3	10.0	3	10.0		
Others	11	36.7	13	43.3		
History of smoking:						
No	24	80.0	24	80.0	**.052**	**0.81**
Yes	6	20.0	6	20.0		

**** Significant at ≤ 0.05***

Table (1): Clarified that, 40% of the study group and 30% of the control group their age was ranged between 30 to less than 40 years. Male represents 63.3% and 56.7% of the study and control groups respectively. Related to marital status 76.7% of the study and control groups were married. 53.3% and 46.7 of the study and control groups respectively cannot read and write. According to residence 86.7% and 90% of the study group and control group came from urban area. Regarding occupation 43.3% and 40% of the study and control groups were worker. While, 80% of both the study and control groups had no history of smoking also there were no significant statistical differences between study and control groups in relation to personal characteristics.

Table (2): Frequencies and percentages distribution of medical data among the study and control groups (N=60).

Variables	Study group (N=30)		Control group (N=30)		χ^2	P- value
	No.	%	No.	%		
Associate diseases:						
No	28	93.3	22	73.3	**.779**	**.677**
Diabetes	2	6.7	6	20.0		
Respiratory disorders	0	0.0	2	6.7		
Current surgery;						
GIT	15	50.0	9	30.0	**6.07**	**.732**
Urology	7	23.3	9	30.0		
Liver & biliary	3	10.0	7	23.3		
Thyroid	5	16.7	5	16.7		
Type of anesthesia						
General	25	83.3	25	83.3	**.048**	**.827**
Spinal	5	16.7	5	16.7		

** Significant at ≤ 0.05*

Table (2): Showed that, 93.3% and 73.3% of the study and control groups respectively had no associate diseases. According to the current surgery 50% of the study group and 30% of the control group undergone gastrointestinal (GIT) surgery; in addition, 83.3% of both groups received general anesthesia. Also, there were no significant statistical differences between study and control groups in relation to medical data.

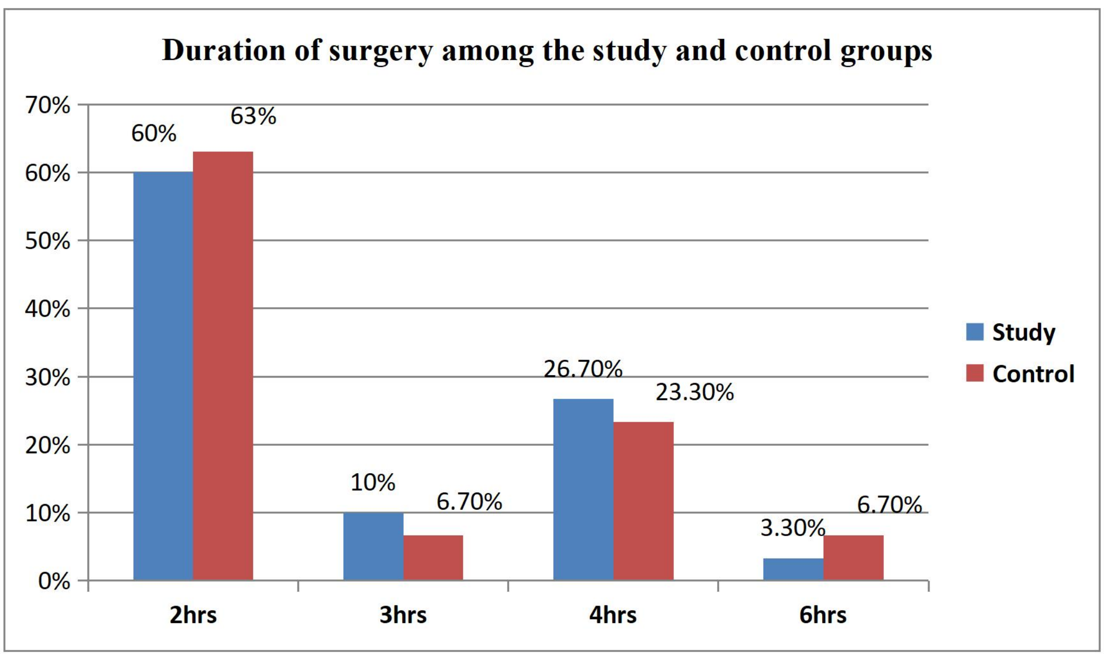

Figure 1: Duration of surgery among the study and control groups.

Figure (1): Denoted that, (60% and 63%) of the study and control groups stayed in surgery for 2 hours.

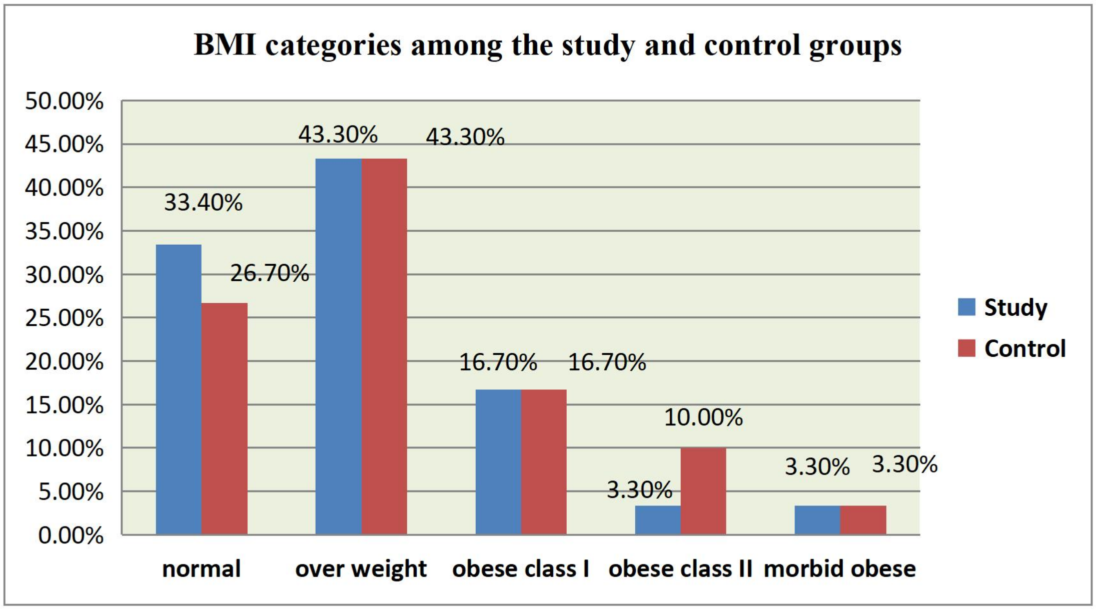

Figure2: Body mass index categories among the study and control groups.

Figure (2): Displayed that, (43.3%) of both study and control groups their BMI category was overweight. As well, there was no statistically significant difference between both groups ($\chi 2$ = 18.23, P-value=.310).

Table (3): Comparison of hemodynamic parameters mean scores before leg maneuver exercise among the study and control groups (N= 60)

Hemodynamic parameters	Pre-measurements			
	Study group (N=30) Mean±SD	Control group (N=30) Mean±SD	T-test	P-value
Heart rate	83.73±6.78	86.30±8.54	**1.28**	**.203**
Systolic blood pressure	116.76 ±7.66	118.70 ±10.80	**.799**	**.427**
Diastolic blood pressure	78.00±6.43	77.16±7.93	**.447**	**.657**

*** Significant at ≤ 0.05**

Table (3): Illustrated that, there was no statistically significant difference between the study and control groups before leg maneuver exercise in relation to heart rate (T test =1.28, p- value=.203), systolic blood pressure (T test =.799, p- value=.427) and diastolic blood pressure with (T test =.447, p-value=.657)

Table (4): Comparison of hemodynamic parameters mean scores post leg maneuver exercise during lying position among the study and control groups (N= 60)

Hemodynamic parameters	Post-Exercise Lying position reading								
	Study group (N=30) 1st day Mean± SD	Control group (N=30) 1st day Mean± SD	T-test P-value	Study group (N=30) 2nd day Mean± SD	Control group (N=30) 2nd day Mean± SD	T-test P-value	Study group (N=30) 3rd day Mean± SD	Control group (N=30) 3rd day Mean± SD	T-test P-value
Heart rate	81.90± 6.91	85.66± 7.37	**2.04 .045***	82.70± 4.92	86.26± 7.83	**2.11 .039***	81.93± 5.43	84.60± 7.38	**1.10 .115**
Systolic blood pressure	106.60± 6.12	108.50 ±10.26	**.870 .388**	110.50 ±5.75	109.63 ±11.66	**.365 .717**	110.50 ±6.06	107.80 ±9.65	**1.29 .200**
Diastolic blood pressure	71.96 ±8.39	77.16 ±7.93	**.315 .754**	74.23 ±6.26	71.70 ±8.93	**1.27 .209**	72.93 ± 7.00	69.90 ±6.89	**1.69 .096**

*** Significant at ≤ 0.05**

Table (4): Described that, there was a statistically significant difference between the study and control groups related heart rate mean scores on the first and second day after leg maneuver exercise at lying position (T test=2.04, p-value=.045) (T test=2.11, p-value=.039) respectively. While there was no statistically significant difference between the study and control groups regarding systolic blood pressure mean scores on the 1st, 2nd and 3rd day of lying position (T test =.870 p- value=.388) (T test =.365, p-value=.717) (T test =1.29, p-value=.200) respectively. And also, diastolic blood pressure mean score on the 1st, 2nd and 3rd day of lying position (T test =.315, p- value= .754) (T test =1.27, p-value=.209) (T test =1.69, p-value.096) respectively.

Table (5): Comparison of hemodynamic parameters mean scores post leg maneuver exercise after 1 min of standing position among the study and control groups (N= 60).

Hemodynamic parameters	Post-Exercise Standing position reading (after 1min)								
	Study group (N=30) 1st day Mean± SD	Control group (N=30) 1st day Mean± SD	T-test P-value	Study group (N=30) 2nd day Mean± SD	Control group (N=30) 2nd day Mean± SD	T-test P-value	Study group (N=30) 3rd day Mean± SD	Control group (N=30) 3rd day Mean± SD	T-test P-value
Heart rate	82.86± 5.59	86.00± 7.14	1.89 .054	82.66± 6.28	86.76± 6.93	2.39 .020*	81.93± 6.11	86.23± 7.53	2.42 .018
Systolic blood pressure	109.96± 6.82	109.46 ± 12.72	.190 .850	112.56± 7.19	109.83± 14.17	.942 .350	114.00± 6.53	109.20± 11.88	1.93 .065
Diastolic blood pressure	71.50± 5.88	71.16 ± 7.83	.186 .850	73.33 ± 6.11	71.03 ± 9.76	1.09 .279	74.16 ± 6.21	70.70± 7.93	1.88 .065

*** Significant at ≤ 0.05**

Table (5): Clarified that, there was a statistically significant difference between the study and control groups related heart rate mean scores on the second day post leg maneuver exercise after one minute of standing position (T-test=2.39, p-value=.020). Whereas there was no statistically significant difference between the study and control groups in relation to systolic blood pressure mean scores on the 1st, 2nd and 3rd day after one minute of standing position (T test =.190, p- value=.850) (T test =.942, p-value=.350) (T test =1.93, p-value=.065) respectively. Besides diastolic blood pressure mean score on the 1st, 2nd and 3rd day after one minute of standing position (T test =.186, p- value= .850) (T test =1.09, p-value=.279) (T test =1.88, p-value=.065) respectively.

Table (6): Comparison of Hemodynamic Parameters Mean Scores Post Leg Maneuver Exercise after 3 min of Standing Position among the Study and Control Groups (N= 60).

Hemodynamic parameters	Post –measurements Standing position reading (after 3min)								
	Study group (N=30) 1st day Mean± SD	Control group (N=30) 1st day Mean± SD	T-test P-value	Study group (N=30) 2nd day Mean± SD	Control group (N=30) 2nd day Mean± SD	T-test P-value	Study group (N=30) 3rd day Mean± SD	Control group (N=30) 3rd day Mean± SD	T-test P-value
Heart rate	82.96± 6.73	86.53± 7.42	1.94 .056	82.60± 4.50	87.83± 6.52	3.61 .001**	82.36± 4.43	85.96± 6.12	2.60 .012*
Systolic blood pressure	113.86± 5.99	110.03 ±12.21	1.54 .128	114.76± 6.32	110.93 ±14.35	1.33 .186	116.30± 4.16	109.73 ±12.23	2.78 .007*
Diastolic blood pressure	74.46 ± 6.94	71.36 ±6.86	1.73 .087	75.73 ± 6.52	72.86 ±7.18	1.61 .111	76.26 ± 4.33	71.60 ±7.61	2.91 .005*

*** Significant at ≤ 0.05**

Table (6): Lightened that, there was a statistically significant difference between the study and control groups related heart rate mean scores on the second and third-day post leg maneuver exercise after three minute of standing position (T-test=3.61, p-value=.001) (T-test=2.60, p-value=.012) respectively. Also, in relation to systolic and diastolic blood pressure on the third day after three minutes of standing position (T test =2.78, p- value=.007) (T test =2.91, p-value=.005) respectively.

Table (7: Comparison of hemodynamic parameters total mean scores over readings (lying, after one minute and three minute of standing position) among the study and control groups (N= 60).

Hemodynamic parameters	Study group (N=30)		Control group (N=30)	
	F	P-value	F	P-value
Heart rate	.287	.978	.377	.945
Systolic blood pressure	7.58	.000**	1.90	0.051
Diastolic blood pressure	2.83	.003**	1.91	0.050*

*** Significant at ≤ 0.05**

Table (7): Showed that, there was a highly statistically significant difference between the study and control groups related systolic blood pressure after leg maneuver exercise over readings as (F=7.58, p-value=.000) (F =1.90, p-value=0.051) respectively and diastolic blood pressure as (F =2.83, p-value=.003) (F =1.91, p-value=0.050) respectively.

Table (8): Comparison of orthostatic hypotension related symptoms total mean scores post leg maneuver exercise among the study and control groups (n= 60).

Orthostatic hypotension related symptoms	Study group (N=30) Mean±SD	Control group (N=30) Mean±SD	T-test	P-value
1st day/Post leg maneuver exercise	11.43± 6.03	16.96± 7.64	3.11	.003**
3rd day/Post leg maneuver exercise	3.03± 1.40	13.73± 6.20	9.20	.000**
Paired T –test P-value	8.55 .000**	2.14 .040*		

* **Significant at ≤ 0.05**

Table (8): Revealed that, there was a highly statistically significant difference between the study and control groups in relation to orthostatic hypotension related symptoms post leg maneuver exercise at the 1st day as (T-test=3.11, p-value=.003) and also at the 3rd day as (T-test=9.20, p-value=.000). Moreover, there was a highly statistically significant difference between 1st and 3rd day in relation to orthostatic hypotension related symptoms among the study group as (Paired T-test = 8.55, p-value=.000) while there was a statistically significant difference among the control group as (Paired T-test = 2.14, p-value=.040).

Discussion:

Postoperative complications are still a significant clinical issue associated with surgery. Orthostatic hypotension (OH) is one of the problems that can be avoided with early mobilization utilizing leg exercises, which is why it should be used in postoperative care. Findings of the current study revealed that, there was no significant statistical difference between the study and the control groups in relation to personal characteristics as more than one third of the study sample aged between thirty to less than forty years; workers; and overweight. More than one half of them were males, married, and stayed in surgery for two hours. In addition, more than three quarters of them were from urban areas, had no history of smoking, no associate disease, underwent GIT surgery, as well as received general anesthesia. This finding is congruent with (Gobezie, Endalew, Tawuye & Aytolign, 2023) who studied "Prevalence and associate factors of postoperative orthostatic intolerance" found that, 217 out of 240 participants were male and their median age (34) about two third of them received general anesthesia and stayed in surgery from one hour and half to two hours.

Additionally, the current study found that male patients were considerably more likely than female to experience orthostatic hypotension. Hanada et al. (2017) showed that roughly 40% of patients had orthostatic hypotension during early mobilization following operations, and male gender was found to be an independent risk factor for orthostatic hypotension during early mobilization which is in line with results of the current study findings. As well, this finding supports the notion that female individuals exhibited superior cerebral autoregulation and were more adept at maintaining cerebral flow velocities during postural shifts, while the precise processes underlying these gender-based variations in autoregulation are yet unknown (Luukkonen, Tiihonen, Rissanen, Hartikainen & Nykänen, 2018). However, in other research, the opposite relationship was noted: higher drops in blood pressure upon standing were linked to female gender (Clark, Thomas, Warren, Llewellyn, Ferrucci, & Campbell, 2018). From the researchers' point of view, these findings could indicate that gender differences are more closely related to the uniqueness of health issues and how they are treated in men and women than they are to gender. Also, the previous researches finding about the relationship between orthostatic hypotension and gender are incongruous; while the frequency of orthostatic hypotension was shown to be unrelated to gender (Saedon, Tan & Frith, 2018).

In reference to body mass index, the current study finding reported that; one third of the studied sample had normal body mass index and nearly half of them were slightly overweight and their blood pressure decreased postoperatively, which supported by Spadavecchia, Dorairajan, Sendra & Chockalingam, (2022) as when assessing the "Association of Obesity with Orthostatic Hypertension" interpreted that, increase in body mass index especially severe obesity predisposes especially women to significant standing high blood pressure than patients who had normal body mass index.

Related hemodynamic parameters, the current study revealed no statistically significant difference among the study and the control group regarding lying position. While highly statistically significant differences were found among them regarding heart rate in standing position for one minute and three minutes especially in the second day. It was also found that, there was highly statistically significant differences in systolic and diastolic blood pressure after three minutes in the third day post intervention. This could be interpreted as even though, the standing position causes a gravitational displacement of blood from the thorax to the venous vascular beds of the legs, buttock and abdomen, known as venous pooling resulting in a decrease in cardiac output (CO) and arterial pressure (AP). Crossing one's legs while tensing muscles increases leg blood flow, enhance venous return, and raises arterial blood pressure. The compression of the venous vascular bed at the start of the leg maneuver appears to have the biggest and most immediate effect, moving blood back to the thorax. This effect is accompanied by an enhanced arterio-venous pressure gradient and potentially the withdrawal of the veno-arterial reflex (Clark, Thomas, Warren, Llewellyn, Ferrucci, & Campbell, 2018; Bryarly, Philips, Fu, Vernino, & Levine, 2019).

As well, the current study finding showed a statistically significant difference between the study and control groups post intervention related to heart rate, systolic and diastolic blood pressure. Supporting these results was the study conducted by Fedorowski's research in 2019, who concluded that, leg crossing, when paired with tensed muscles, improves blood flow to the legs and lessens symptoms associated with orthostatic hypotension. In addition, on days one and three after the intervention, the leg maneuver raises heart rate and mean arterial blood pressure. Additionally, Shen, et-al., (2017) measure orthostatic hypotension in surgical patients, with a notably higher frequency of occurrence in men; illustrated that, the systolic-diastolic hypotension was predominated most of the time, systolic orthostatic hypotension was less common, and diastolic hypotension was least common. Only the first and third minutes of standing were associated with an orthostatic decline in blood pressure in more than one half (61.8%) of patients. As a result, the predictions that the leg maneuver would raise heart rate and blood pressure (both systolic and diastolic), as well as the reduction of symptoms associated with orthostatic hypotension, were supported.

Similar results were found in a study conducted by Raji, et.al (2020), who reported that in the thirty seconds prior to standing, the exercise participants executed ten cycles of flexion and extension of the hips, knees, and ankles, whereas the controls merely transitioned from a supine to an upright posture. When measured immediately upon standing, the control group's mean systolic blood pressure (BP) decreased by 27 mmHg, while the exercise group's BP only decreased by 10 mmHg. An important distinction is that the control group's return to baseline blood pressure happened more slowly over the course of the following five minutes than the exercise groups. Also, Bryarly, Philips, Fu, Vernino, and Levine (2019), verified that, significant increases in steady state values were observed in blood pressure, cardiac output and heart rate following the abrupt initial implementation of the leg maneuver which corroborate the finding of the current study. Therefore, the first and second hypotheses of the current study were supported.

Concerning orthostatic hypotension related symptoms, the current study highlights that, there was a highly statistically significant difference between the study and control groups in relation to orthostatic hypotension related symptoms at the first- and third-day post leg maneuver exercise. From the researcher’s viewpoint, improving in hemodynamic parameter (heart rate, systolic and diastolic blood pressure) after practicing leg maneuver exercise among the study group postoperatively by consequently, lead to improvement in the related symptoms of orthostatic hypotension as a result of increase venous return and cardiac output. This finding supported by Mitro, Muller & Lazurova (2019) who reported that, Leg maneuver effects are explained by ending the vicious cycle that keeps the vasovagal reflex active; and demonstrating an antigravity exercise could stop a potential vasovagal faint. They saw sharp rises in cardiac output and central venous pressure, which suggested that blood had been reinfused. As well, proved the third hypothesis of the current study.

Orthostatic Hypotension can be delayed or avoided by applying leg maneuver (crossing and muscle tensing) as a basic physiological intervention at the commencement of prodromal symptoms. Training for leg muscle maneuver greatly enhanced orthostatic "maximal systolic and diastolic blood pressure change." By preventing or delaying syncope, this procedure can enhance patients' hemodynamic state by empowering them to take more control of their symptom. While the maneuver can help some people with their orthostatic intolerance symptoms, it may not be able to totally prevent a syncopal episode, particularly if it is not performed in a timely manner.

Conclusion

The current study concluded that, leg maneuver exercises have a significant effect in improving patients’ hemodynamic parameters (blood pressure & heart rate), and preventing orthostatic hypotension related manifestations.

Recommendations

-Leg maneuver should be recommended as the first-step management of patients who suffering from orthostatic hypotension and its associated symptoms.

-Investigating the impact of leg maneuver on surgical patients will require more controlled clinical trials with larger sample size.

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