The Effect Of Early Activity On Patients Outcome After Open Heart Surgery

Hanaa H. Ahmed*, Youssreya M. Ibrahim*, Azza H. El Soussi and Mohamed M. El Said*****
** Department of Critical Care Nursing, Faculty of Nursing, Mansoura University*
*** Department of Critical Care Nursing, Faculty of Nursing, Alexandria University*
**** Department of Cardio Thoracic Surgery, Faculty of Medicine, Mansoura University*

ABSTRACT

The postoperative phase is the most critical period for open heart surgery during which many serious and fatal complications can occur. Early physical activity can prevent such complications. The role of the critical care nurse is crucial in this concern.

Objectives: *The present study aimed to examine the effect of early activity on patient's outcome after open heart surgery.* ***Design:*** *A comparative experimental design was applied.* ***Setting:*** *This study was conducted in the Intensive Care Unit (ICU) of Open Heart Surgery at Mansoura Main University Hospital.* ***Sample:*** *Fourty adults patients of both sexes undergoing open heart surgery using cardiopulmonary bypass and showing hemodynamic stability.*

Method: *An activity regime was applied to 20 patients who underwent such surgery. The results were compared to a matching control group. Early activity included positioning (supine, left and right sides), early ambulation (dangling, standing near the bed, chair sitting and walking) and chest physiotherapy procedures (coughing, breathing exercises, percussion, vibration and incentive spirometry).*

Results: *Comparing the obtained data revealed a better outcome among the early activity group. This was manifested by better recovery in the respiratory features especially crackles and grade II dyspnea and lung functions (FVC, FEV_1 and MVV). In addition, lower postoperative rates of dysrhythmia and atelectasis were found among the early activity group. Moreover, early activity reduced significantly the length of stay in the ICU. However, no differences could be detected between the two groups concerning oxygenation and hemodynamic parameters and renal indicators.*

Conclusion: *Combination of early activity and chest physiotherapy ameliorates the outcome of patients after open heart surgery. Performing early activity to such patients is recommended.*

INTRODUCTION

Open heart surgery (OHS) is one of the most important procedures that can resolve many cardiac problems. The most important of which are myocardial revascularization, valve repair or replacement, repair of congenital or acquired structural abnormalities, placement of a mechanical assist device, and heart transplantation[1-3].

The post-operative phase is the most critical period for OHS patients. It is characterized by many complications as pulmonary, cardiovascular, neurological and renal, that prolong hospitalization, increase costs and have a direct effect on survival probability[4-6].

In prospective studies of Egyptian patients after open heart surgery, 86% of the patients had postoperative complications with morbidity and mortality rates of 23%and 1.7% respectively[7]. The incidence of postoperative cardiovascular complications was 28.1% (dysrhythmia 9.9%, sudden stroke 3.3%, bleeding 3.3%, thrombus 11.7%). Other complications included: pulmonary (4.5%), infections (4.6%) and renal impairment (7.6%)[8,9].

Generally, the majority of these complications were found to be resolved by early activity in the early postoperative period. It is considered an important area of the collaborative management for patients after open heart surgery[10]. The early activity means the patient's activity that starts from turning in bed and passive range of motion until the patient gets out of bed[11].

Getting out of bed is one of the most important lung expansion maneuvers that increases functional residual capacity, enhances quality of respiration, improves alveolar ventilation, decreases work of breathing and establishes diaphragmatic excursion. In addition, it improves cardiac output, myocardial contractility, resting heart

rate; improves venous return and strengthens cardiac muscle.[12,13] Finally, a significant cost saving could be anticipated due to reduced length of stay in ICU[14].

The critical care nurse has a vital role in the postoperative care of OHS patients. She is mostly responsible for monitoring and assessing the cardiovascular, respiratory, and renal status to create an effective care plan or guidelines. She provides the patients with comfort and safety, encourages mobility and prevents complications. Thus, the nursing role is crucial in reducing the incidence of morbidity and mortality and shortening the length of stay in ICU[14-16].

AIM OF THE STUDY

This study was conducted to determine the effect of early activity on patients' outcome after open heart surgery.

MATERIAL AND METHODS

1- MATERIAL

Design: A comparative experimental design.

Setting: This study was conducted in the Intensive Care Unit of Open Heart Surgery at Mansoura Main University Hospital.

Sample: A convenient sample of forty adult patients of both sexes undergoing open heart surgery using cardiopulmonary bypass and showing hemodynamic stability (normovolemic, $PaCO_2 \leq 50$ mmHg, $PaO_2 \geq 80$ mmHg, respiratory rate ≤ 30 C/m) were included in the study. Patients with contraindication for activity procedures as hemodynamic instability, bleeding tendency, electrolytes imbalance and those with fever (temperature > 38°C) were excluded. The sample was randomly divided into two groups: 20 patients as a study group and 20 patients as control group.

Tools: Two tools were modified and used in this study[4,7,8,11,17-19].

Tool one: "Tolerance indicator sheet" This sheet was used to collect preoperative and postoperative data. The preoperative data were considered as the baseline. These included demographic data (occupation, smoking, type of surgery, sex and age), respiratory features (respiratory pattern, adventitious sounds, dyspnea and chest X-ray), ventilatory indicators (forced expiratory volume in 1 second: FEV_1, forced vital capacity: FVC and maximum voluntary ventilation: MVV), oxygenation indicators (respiratory rate: RR, arterial oxygen tension: PaO_2, arterial carbon dioxide tension: $PaCO_2$ and arterial oxygen saturation: SaO_2), and hemodynamic indicators (peripheral pulse: PP, apical pulse: AP, systolic blood pressure: SBP and diastolic blood pressure: DBP). It also comprised renal function and electrolyte analysis.

Tool two: "Early activity record for patients after open heart surgery". Early activity means the cardiac surgical patient was started his activity after two hours of surgery. Early activity record was designed and used for recording patients' parameters related to activity tolerance which followed the modified guidelines for the early activity program after open heart surgery. The early activities involved turning from the supine to lateral positions right and left, range of motion (ROM) exercises, ambulation and chest physiotherapy. The ambulation procedure comprised dangling, standing near to the bed, chair sitting and walking (7.5 to 30m) as tolerated. The chest physiotherapy procedures were coughing and breathing exercises, and incentive spirometry.

2- METHODS

Permission to conduct the study was obtained from the responsible authorities after explanation of the study's aim. The assessment sheet was developed by the researchers based on reviewing the related literature. A pilot study was carried out on five patients in order to assess the clarity and applicability of the tools. The tools were reviewed by experts and the necessary modifications were done prior to data collection. In formed consent was obtained from each patient to participate in the study. Data collection took approximately six months. The early activity schedule and chest physiotherapy were demonstrated to the study group two days before operation. The patients were instructed to use the spirometer during the preoperative period according to the record schedule. The control group received the routine postoperative hospital care that in clued coughing and breathing exercises only without any preoperative teaching or demonstration. The study group was turned from side to side with head of the bed at 30^o elevation, passive ROM was performed every two hours. Patients were kept in each position

for two hours. When they started to regain their consciousness, active ROM exercises were carried out every two hours. After extubation, patients were instructed to carry out coughing and deep breathing exercises, use incentive spirometry for five minutes every two hours. They were also instructed to splint their chest during exercise performing. During weaning, patients were assisted to dangle on the edge of bed and leave the bed to a chair as tolerated. Then, patients were assisted to get out of bed three times on the first postoperative day. Furthermore, patients were ambulated (7.5-30 m) as tolerated.

Statistical Design:

The collected data were coded and fed into a personal computer. Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 13. Comparisons were done between the study group and control group, as well as, between pre and post operative within each group. Qualitative data were presented as number and percentages, while quantitative data were presented as mean and standard deviation. To assess the significance of results p values of 0.05 or 0.000 were used. Statistical tests used in the present study were paired (t) test within each group to compare pre and 8-hour interval postoperative measurements, while to compare the study and control groups Student's t test was used for quantitative data and chi-square for qualitative data.

RESULTS

Table I presents a comparison between the population characteristics between the early activity and the control groups. No statistically significant differences could be detected between the two groups as regards to age, body weight, occupation, sex and smoking. (p= 0.120, 0.082, 0.468, 0,695 and 0.0997 respectively). The type of surgery was identical in the two groups.

Table II shows the comparison between the early activity and the control groups as regards some respiratory features both pre and postoperatively. All the preoperative respiratory features: respiratory pattern, breath sounds, dyspnea grades and chest X-rays showed no significant differences between the two groups. Postoperatively, grade II dyspnea and atelectasis were significantly more prevalent among the control group (p= 0.038 and 0.006 respectively). Grackles were more prevalent postoperatively in both early activity (P = 0.028) and control (P = 0.008) groups. Atelectasis was more prevalent post-operatively in only the control groups (P = 0.007).

Table I: Comparison of the population characteristics between the early activity and the control groups

Characteristics	Early activity group (n=20)		Control group (n=20)		P-value
	N	%	n	%	
Occupation					
Employee	13	65	10	50	0.468
Unemployed	7	35	10	50	
Smoking					
Smokers	5	25	3	15	0.0997
Non-smokers	15	75	17	85	
Type of surgery					
VR	17	85	17	85	1.00
CABG	3	15	3	15	
Sex					
Male	11	55	10	50	0.695
Female	9	45	10	50	
	X	±SD	X	± SD	
Age (years)	29.75	10.49	35.10	10.79	0.120
Body weight (Kgs)	66.25	11.48	72.90	12.01	0.082

VR: valve replacement
CABG: coronary artery bypass graft
All p values are insignificant

Table III describes the differences between the early activity and the control groups concerning the ventilatory indicators both pre and postoperatively. Preoperatively, no statistically significant differences could be detected between the two groups as regards FEV_1, FVC and MVV. FEV_1 was significantly lower among the control group postoperatively (p=0.050). Comparing preoperative and postoperative ventilatory indicators, FEV_1 and FVC showed a significant decrease post operatively for both the early activity group (p=0.010 and 0.031 respectively) and the control group (p=0.000), while MVV decreased significantly only among the control group (0.000).

Table IV shows the comparison of the oxygenation indicators between the early activity and the control groups both pre and postoperatively. No statistically significant differences could be detected between the two groups for the preoperative oxygenation indicators: RR, PaO_2, $PaCO_2$ and SaO_2. Postoperatively, only RR was significantly higher among the control group at 32, 40 and 48 hours (P= 0.000). Comparing the pre and postoperative oxygenation indicators of the early activity group, there was a postoperative significant decrease in RR at 0 and 8 hours (p= 0.000), an increase in PaO_2 at 0, 8, 16, 24, 32 and 40 hours (p=0.000) and SaO_2 at 0, 8, 16 and 32 hours (p= 0.000). $PaCO_2$ showed no significant changes. For the control group, there was a postoperative significant decrease in RR at 0, 8, 24 and 48 hours (p=0.000), an increase in PaO_2 at 0, 8, 16, 24, 32, 40 hours (p= 0.000) and SaO_2 at 0, 8 and 16 hours (p= 0.000). Again, $PaCO_2$ showed no significant changes. Comparing the zero and subsequent 48 hours postoperatively, the early activity group showed a significant increase in RR at 8, 16, 24, 32, 40 and 48 hours (p=0.000), a decrease in PaO_2 and SaO_2 at 16, 24, 32, 40 and 48 hours (p=0.000). No changes could be detected in $PaCO_2$. For the control group, there was a postoperative significant increase in RR and a significant decrease in PaO_2 and SaO_2 at 16, 24, 32, 40 and 48 hours (p=0.000). $PaCO_2$ significantly increased at 32 hours only (p=0.000).

Table V shows the comparison of the hemodynamic indicators between the early activity and the control groups both pre and postoperatively. No statistically significant differences could be detected between the two groups for the preoperative hemodynamic indicators: PP, AP, SBP and DBP. Postoperatively, only SBP was significantly higher among the early activity group at 16, 40 and 48 hours (P= 0.000). Comparing the pre and postoperative hemodynamic indicators of the early activity group, there was a postoperative significant increase in PP at all times (p= 0.000), and in AP at 0, 8, 32, 40 and 48 hours (p= 0.000) and a decrease in DBP at 0, 8, 16, 24, 32 and 40 hours (p= 0.000). SBP showed a significant difference from the preoperative value only at 0 hour (p=0.000). For the control group, there was a postoperative significant increase in PP at 0, 8, 16, 24, 32, 40 and 48 hours (p= 0.000), and in AP at 0, 8, 32, and 48 hours (p= 0.000) and a decrease in SBP and DBP at 0 and 40 hours respectively (p= 0.000). Comparing the zero and subsequent 48 hours postoperatively, the early activity group showed a significant decrease in PP at 16 hours (p= 0.000), and AP at 16, 24, 32, 40 and 48 hours (p= 0.000) and SBP at 16, 32, 40 and 48 hours (p= 0.00) and an increase in DBP and 8 and 48 hours (p= 0.00). For the control group, there was a postoperative significant decrease in AP at 8, 16, 24 and 40 hours. No changes could be detected concerning PP, AP and DBP.

Table VI demonstrates the comparison between the early activity and the control groups in the renal laboratory investigations both pre and postoperatively. No significant differences could be found between the two groups neither pre nor postoperatively in the levels of creatinine, potassium and sodium. However, when comparing between the pre and postoperative values, the creatinine levels significantly increased for both early activity and control groups (p= 0.017 and 0.001 respectively).

Table VII compares between the early activity and control groups as regards the outcome criteria. The percentage of cases showing dysrhythmia among the early activity group was significantly lower than those of the control group (15% versus 60%, P=0.01). The same picture was obtained concerning atelectasis, which was predominant among 25% of the early activity group versus 70% of the control group (P=0.01). Also, the mean length of

stay of the early activity group was significantly (P = 0.00) shorter (44.95 ± 13.99 hours) than that of the control group (122.45 ± 50.99 hours). No statistical difference could be detected between the two group concerning hypotension (P=1.00), obstructive (P=0.75) or restrictive (P=0.52) ventilation, hemothorax (P=1.00) and renal impairment. No mortality has been recorded among any group.

Table III: Comparison of ventilatory indicators between the early activity and the control groups both pre and postoperatively

Ventilatory indicators	Early activity group				Control group				P-value
	Pre		Post		Pre		Post		
	X	±SD	X	±SD	X	±SD	X	±SD	
FEV_1(%)[a,b,c]	78.4	17.8	65.6	18.6	80.9	17.5	54.1	17.4	$P^{(a)}$= 0.050 $P^{(b)}$= 0.010 $P^{(c)}$= 0.000
FVC (%)[b,c]	74.1	20.0	60.1	19.5	75.4	18.9	48.8	17.3	$P^{(b)}$= 0.031 $P^{(c)}$= 0.000
MVV (%)[c]	66.8	23.6	58.2	20.2	71.4	29.9	47.6	16.8	$P^{(c)}$= 0.000

FEV_1: forced expiratory volume in 1 second.
FVC: forced vital capacity.
MVV: maximum voluntary ventilation
Statistically significant difference, p < 0.05, 0.01:
(a) between early activity and control groups postoperatively.
(b) between pre and postoperative of the early activity group
(c) between pre and postoperative of the control group

Table IV: Comparison of oxygenation indicators between the early activity and the control groups both pre and postoperatively

Oxygenation indicators (X±SD)	Pre-operative	Postoperative						
		0 hour	8 hours	16 hours	24 hours	32 hours	40 hours	48 hours
		Early activity group (n=20)						
RR	24.35 ± 4.94	18.45[b] ± 4.62	21.35[b,d] ± 4.48	23.50[d] ± 4.52	25.10[d] ± 6.41	24.40[a,d] ± 4.84	24.90[a,d] ± 5.52	25.65[a,d] ± 5.60
PaO_2	82.40 ± 4.46	211.60[b] ± 6.44	180.50[b] ± 45.98	150.70[b,d] ± 57.64	121.60[b,d] ± 96.44	121.40[b,d] ± 41.52	105.40[b,d] ± 30.44	87.17[d] ± 18.62
$PaCO_2$	40.52 ± 7.69	41.91 ± 2.81	41.99 ± 7.50	40.99 ± 8.94	41.70 ± 7.02	41.76 ± 4.48	40.53 ± 4.43	38.70 ± 5.61
SaO_2	96.71 ± 1.34	99.13[b] ± 0.50	99.05[b] ± 0.68	98.65[b,d] ± 1.01	99.13[d] ± 0.50	97.86[b,d] ± 1.12	97.29[d] ± 1.52	97.16[d] ± 1.39
		Control group (n=20)						
RR	27.25 ± 5.78	18.05[c] ± 1.90	20.40[c] ± 5.09	25.05[e] ± 4.95	24.00[c,e] ± 5.42	27.75[e] ± 4.40	29.30[e] ± 3.63	30.90[c,e] ± 4.38
PaO_2	81.99 ± 8.59	272.00[c] ±133.80	191.70[c,e] ± 97.87	160.90[c,e] ± 65.56	152.70[c,e] ± 98.37	123.30[c,e] ± 80.15	118.70[c,e] ± 76.40	90.45[e] ± 29.07
$PaCO_2$	41.15 ± 7.6	38.05 ± 8.80	40.60 ± 11.15	41.93 ± 9.51	40.95 ± 7.30	42.61[e] ± 4.90	43.43 ± 6.87	39.17 ± 6.89
SaO_2	96.23 ± 2.76	99.56[c] ± 0.38	98.84[c,e] ± 1.17	98.31[c,e] ± 2.30	97.69[e] ± 2.37	96.62[e] ± 3.23	96.85[e] ± 2.21	96.71[e] ± 1.41

RR: respiratory rate
PaO_2: arterial oxygen tension
$PaCO_2$: arterial carbon dioxide tension
SaO_2: arterial oxygen saturation
Statistically significant difference, at $P \leq 0.01$ (all P value = 0.000):
(a) between early activity and control groups postoperatively.
(b) between pre and postoperative of the early activity group.
(c) between pre and postoperative of the control group.
(d) between zero and subsequent 48 hours of the early activity group postoperatively.
(e) between zero and subsequent 48 hours of the control group postoperatively.

Table V: Comparison of hemodynamic indicators between the early activity and the control groups both pre and postoperatively

Hemo-dynamic indicators (X±SD)	Pre-operative	Postoperative						
		0 hour	8 hours	16 hours	24 hours	32 hours	40 hours	48 hours
	Early activity group (n=20)							
PP	68.60 ± 11.78	82.75$^{(b)}$ ± 14.23	78.60$^{(b)}$ ± 12.45	75.50$^{(b,d)}$ ± 10.03	78.90$^{(b)}$ ± 8.50	78.10$^{(b)}$ ± 6.84	80.80$^{(b)}$ ± 9.24	82.25$^{(b)}$ ± 8.14
AP	85.45 ± 9.58	107.25$^{(b)}$ ± 23.52	99.60$^{(b)}$ ± 18.80	90.65$^{(d)}$ ± 14.70	92.95$^{(d)}$ ± 14.87	93.10$^{(b,d)}$ ± 2.11	95.15$^{(b,d)}$ ± 9.75	96.10$^{(b,d)}$ ± 10.50
SBP	120.50 ± 12.76	144.2$^{(b)}$ ± 16.59	122.2 ± 16.0	123.5$^{(a,d)}$ ± 14.13	120.2 ± 16.52	122.6$^{(d)}$ ± 16.69	124.9$^{(a,d)}$ ± 15.87	125.25$^{(a,d)}$ ± 16.45
DBP	76.50 ± 10.40	62.55$^{(b)}$ ± 12.29	69.30$^{(b,d)}$ ± 10.87	67.20$^{(b)}$ ± 13.34	69.00$^{(b)}$ ± 12.08	68.65$^{(b)}$ ± 12.04	69.00$^{(b)}$ ± 10.43	73.60$^{(d)}$ ± 11.13
	Control group (n=20)							
PP	72.90 ± 10.38	82.05$^{(c)}$ ± 16.45	79.60$^{(c)}$ ± 11.98	79.35$^{(c)}$ ± 8.07	79.80$^{(c)}$ ± 10.81	80.00$^{(c)}$ ± 9.89	79.05$^{(c)}$ ± 9.48	84.15$^{(c)}$ ± 12.11
AP	89.25 ± 9.33	103.45$^{(c)}$ ± 15.66	97.60$^{(c,e)}$ ± 10.84	92.90$^{(e)}$ ± 10.84	95.10$^{(e)}$ ± 12.19	97.05$^{(c)}$ ± 10.93	94.95$^{(e)}$ ± 8.54	100.00$^{(c)}$ ± 11.83
SBP	121.0 ± 19.17	109.80$^{(c)}$ ± 17.07	120.25 ± 7.46	116.30 ± 8.50	118.90 ± 13.05	120.45 ± 12.18	133.05 ± 8.51	115.85 ± 10.82
DBP	70.50 ± 14.32	67.35 ± 18.69	68.70 ± 9.18	65.15 ± 6.02	69.85 ± 9.59	67.05 ± 5.71	64.30$^{(c)}$ ± 6.51	71.45 ± 12.46

PP: peripheral pulse AP: apical pulse
DBP: diastolic blood pressure SBP: systolic blood pressure

Statistically significant difference, at P ≤ 0.01 (all P value = 0.000):

(a) between early activity and control groups postoperatively.
(b) between pre and postoperative of the early activity group.
(c) between pre and postoperative of the control group.
(d) between zero and subsequent 48 hours of the early activity group postoperatively.
(e) between zero and subsequent 48 hours of the control group postoperatively.

Table VI: Comparison of renal laboratory investigations between the early activity and the control groups both pre and postoperatively

Renal laboratory investigations	Early activity group				Control group			
	Pre		Post		Pre		Post	
	X	± SD	X	± SD	X	± SD	X	± SD
Creatinine$^{(a,b)}$	0.850	0.051	0.970	0.215	0.875	0.107	0.995	0.170
Potassium	4.010	0.499	3.905	0.383	3.845	0.414	4.100	0.376
Sodium	136.42	3.801	137.87	3.629	134.78	4.318	135.63	5.120

Statistically significant difference, p ≤ 0.05, 0.01:

(a) between pre and postoperative of the early activity group (P = 0.017).
(b) between pre and postoperative of the control group (P = 0.001).

DISCUSSION

The main challenge for the critical care nurse is caring for open heart surgery patients. They develop several postoperative complications that may prolong postoperative recovery. Many of these were said to be prevented by early activity which is one of the many nurses' duties[12-16]. This is what the present study tries to prove.

In the present sample, no statistically significant differences were found between early activity and control groups concerning the population characteristics. This demonstrates the homogeneity of the two selected groups, therefore any difference between them can be referred only to the applied regime of early activity.

The present study showed an increase in wheezes in both studied groups post-operatively. This mucus retention might be due to prolonged supine position during operation, endotracheal intubation and artificial ventilation[20, 21]. However, this increase was found to be less in the early activity group

Table VII: Comparison of the outcome criteria between the early activity and the control groups postoperatively

Outcome criteria	Early activity group (n=20)		Control group (n=20)		P-value
	N	%	n	%	
A- Morbidity rate					
1- Cardiovascular					
- Dysrhythmia	3	15	12	60	0.01*
- Hypotension	2	10	3	15	1.00
2- Respiratory					
- Obstructive ventilation	7	35	9	45	0.75
- Restrictive ventilation	7	35	10	50	0.52
- Atelectasis	5	25	14	70	0.01*
- Hemothorax	0	0	1	5	1.00
3- Renal impairment	0	0	0	0	-
B- Mortality rate	0	0	0	0	-
	X	**±SD**	**X**	**±SD**	
C- Length of stay (hours)	44.95	13.99	122.45	50.99	0.000*

* Statistically significant difference at $P \leq 0.01$.

when compared to the control. It has been proved that postoperative ambulation increases minute ventilation by increasing respiration rates. This improves airway clearance by enhancing the action of two-phase gas-liquid flow[5].

A reduction in the pulmonary functions was found in the present study after operation. This reduction in FVC, FEV_1 and MVV has reported in literature and has been referred to general anesthesia, surgical wound and pain that lead to chest wall and diaphragmatic dysfunction[8,22,23]. Again, this reduction was less pronounced in the early activity group. Literature reported that addition of breathing exercises or incentive spirometry to a regime of early mobilization and coughing confers no extra benefit after uncomplicated CABG.[24] However, better preserved lung function has been reached by shunting improving ventilation and early extubation,[25] encouraging patients to walk,[26] applying a program of postural drainage with percussion,[27] and use of preoperative and postoperative breathing exercises.[28] Moreover, it has been found that getting the patient out of bed is one of the most important postoperative lung expansion maneuvers[2] and a mechanism has been proposed whereby ambulation and stair climbing contribute to the prophylaxis and resolution of atelectasis by increasing the rate and depth of respiration and the recruitment of poorly ventilated alveoli.[29]

A decrease in RR postoperatively was found in the present study among both early activity and control groups. The RR increased significantly from the postoperative baseline value. This increase was less pronounced in the early activity group. It has been found that the frequency of breathing increases 42% in the supine and 31% in the semi-sitting position postoperatively[30]. The increase in RR might recruit atelectatic lung units with a resultant improvement in V/Q matching and contribute to the mobilization of bronchial secretions[29].

In the present study, both groups showed an increase in PaO_2 and SaO_2 at 0 hour postoperatively, then by time it deceased to reach almost the preoperative value. No difference was found between the two groups. This is supported by other studies which reported no difference in SaO_2 in right, left lateral and supine position overtime[31].

In the present study SBP increased in the early activity group and decreased in the control group after operation, while DBP decreased in the early activity group only. Both parameters returned almost to the preoperative values after 48 hours. No difference could be detected between the early activity and the control groups. Similar results have been reported where neither postural treatment[31] nor turning the patient[27] affected the hemodynamic stability. However, another study reported

an increase in both SBP and DBP during ambulation and stair climbing[29].

The current findings revealed an increase in the creatinine levels after operation among both early activity and control groups, while potassium and sodium levels were not affected. No difference has been found between the two groups. Similar results have been obtained[32-34] and have been referred to prolonged duration of CBP and cross clamping and tubular necrosis precipitated by prolonged hypotension or hypovolemia.

The present study showed a significant decrease in the length of stay in ICU among the early activity group. Several results reported such finding[14,35-37]. This might be referred to the improvement of the patients' outcome including pulmonary functions and cardiovascular stability that lead to rapid recovery and early discharge[19,22,38].

CONCLUSION

It can be concluded that combination of early activity and chest physiotherapy do prevent at least the respiratory complications frequently encountered after open heart surgery, improved ventilation parameters and oxygenation parameters.

RECOMMENDATIONS

Based on the finding of the present study the following are recommended:

1- Perform early activity to the cardiac surgical patients postoperatively as soon as early (Two hours after surgery).
2- Direct efforts toward changing nurses' beliefs and decisions about postoperative early activity for cardiac surgical patients.
3- In service educational programs should e conducted for critical care nurses regarding benefits of early activity to critically ill patients.

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