

The Effect of Semi Sitting, Supine and Lateral Positions on Results of Arterial Blood Gases and Vital Signs in Patients undergoing Coronary Artery Bypass Graft Surgery

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Abstract: Introduction: Imperfect gas exchange, including mainly hypoxia is one of the most common problems of patients after coronary artery bypass surgery in critical care unit. Positioning of intensive care patients may be applied to enhance arterial blood oxygenation, prevent atelectasis and gathering of mucus. Appropriate positioning of the critically ill patient can dramatically improve care unit and outcome. This study aimed to determine the effect of different positions (supine, semi sitting and left and right lateral) on arterial blood gases and vital signs in patients under coronary artery bypass graft surgery. **Method:** In this clinical trial study the effect of four positions on arterial blood gases and vital signs in 60 patients, aged 30-60, after coronary artery bypass graft (CABG), who were receiving mechanical ventilation, and selected via convenience sampling was examined. Arterial blood gas analysis was performed in supine, semi sitting, 30° left and right lateral position after keeping the patients in a given position for 30 minutes. Necessary information's obtained from patients' documents and laboratory results. Data were analyzed by SPSS computer software, version 17 and data were analyzed using repeated measures of ANOVA and bonferroni test. **Results:** statistically significant differences were found in PaO₂ and O₂ Sat averages in different positions (P=0.00). PaO₂ and O₂ Sat values were significantly higher in the left lateral (PaO₂=96.4 ± 28.93 mmHg, O₂ Sat=95.7 ± 3.32 %) than other positions. But no significant difference was found between BE, HCO₃, PH, PCO₂ averages (P>0.05). Therefore the averages of BE, HCO₃, PH, PCO₂ were statistically equal in all positions. Results showed significant differences in averages of respiratory rate, temperature and diastolic blood pressure in four positions (P<0.00). Respiratory rate increased in different positions in turn. However respiratory rate was significantly higher in the left lateral position (14.16 ± 1.75) than other positions. No significant difference was found in heart rate and systolic blood pressure (P>0.05). Therefore the averages of heart rate and systolic blood were equal in all positions. **Conclusion:** Not only change position has not negative effect on patient's vital signs and arterial blood gases, but also applying it improves PaO₂, O₂ sat and respiratory rate. Lateral position (especially left lateral position) improves oxygenation in this patient after coronary artery bypass graft surgery and there is no contraindication to use it.

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Key words: Change position, arterial blood gases, vital signs, coronary artery bypass graft

1. Introduction

Imperfect gas exchange, including mainly hypoxia is one of the most common problems of patients after coronary artery bypass surgery in critical care unit (2).

These patients for reasons such as: muscle relaxant drugs, Anesthesia drugs, chest surgery, changes in breathing patterns, pain, fluid retention, increasing the back position for a long time, are always vulnerable to hypoxia and complications from

it, including metabolic acidosis, cerebral edema, pulmonary hypertension, decreased cardiac output, dangerous dysrhythmias, myocardial infarction, tachypnea, increased duration of mechanical ventilation and length of hospitalization (3, 4).

Long periods of bed rest in patients with showing a gradual deterioration in the structure of a body part with a consequent loss of the part's ability to function are common. Another reason for the especially to limit patient movement, different

equipment and pipes connected to a ventilator and monitor. (6).

Prevent complications from immobility, the patient's frequent switching and change positioning is required (7).

Strategy that reduces the side effects are prolonged bed rest, and change the status of clinical nursing care priorities in preventing complications and improving patients has increased (8).

Change in status to prevent bed sores, improve oxygenation, reduce urinary stasis, improve sensory stimulation is effective. Change the status of regional lung ventilation and drainage of mucus from the sinuses and the lung cavities. It also reduces the discomfort caused by immobility; especially back pain is the body. These provide stimulation and exercise therapy may reduce calls in humans (9). Change in status, even during sleep in normal subjects is approximately every 12 minutes, and sensory symptoms in response to rapid changes in body position and movement sense of the term is used to prevent adverse effects (12, 13 and 14).

In reference books, nursing shift patients every 2 hours in patients immobilized with crisis situations, a standard of care nursing. Review doctors sectors in particular shows that 85 percent of their changing status of the patient every 2 hours in specific departments agree are. Nurses should make use of the treatment to prevent complications of immobility.

Several factors such as changes in level of consciousness that will prevent movement (paralysis and sedating s) are resulting from traumatic injuries and surgical complications (open abdominal cavity) causing a long rest patient is in bed (3, 4).

Nursing care and the necessity of these complications placing the patient in good condition to prevent complications and improve patients are aware. In addition, factors such as patient intolerance and hemodynamic instability, as is also (15, 16 and 17). Placing the patient in proper position during surgery is an important part of care.

The purpose of this action was to facilitate the surgical technique and minimize its risks. The appropriate state agencies will be required during the procedure more accessible and respiratory function and blood flow and muscle and skin is protected.

Placing the patient in good condition requires knowledge of anatomical and physiological principles are. Status of the body can create different physiological effects.

Including: change of heart - vascular and respiratory tract is mainly due to the influence of gravity on the distribution of blood flow and pulmonary venous and arterial system occurs. Also changes diaphragm movement due to pressure from

abdominal viscera, including the factors causing respiratory effects in different body positions (19).

2. General research

This research framework based on concepts deemed status changes, arterial blood gases, mechanical ventilation, vital signs (blood pressure, pulse, temperature, and breathing), coronary artery bypass and intensive care unit is based.

2.1. Study population, sampling and research design

A-1 - The type of research

This study is a clinical trial in which the conditions supine, semi sitting and lateral position, arterial blood gas and vital signs results on the side of patients were undergoing coronary artery bypass surgery.

A-2 - Community Research Participants

All patients admitted to intensive care, open heart surgery Ahwaz Imam Khomeini Hospital undergoing coronary artery bypass surgery have been constituted.

A-3 - Environmental Research

Research environment, open heart surgery intensive care unit of Imam Khomeini Hospital, Ahwaz *Jundishapur* University of Medical Sciences, and Ahwaz is linked to.

A-4 - sample

This sampling method was so easy and accessible to patients who were undergoing coronary artery bypass surgery were entered into the study (60 patients) participated in the study.

A-5 - Method for calculation of sample size

Sample size using previous studies (40) and using the formula:

$$n = \frac{\left(z_1 - \frac{\alpha}{2} + z_1 - \beta\right)^2 (\delta_1^2 + \delta_2^2)}{(\mu_1 - \mu_2)^2}$$

Considering the significance level test, $\alpha = 0.05$ and the test 90% for detecting at least one standard deviation change in mean variables studied were calculated.

2.2. Methods

In this clinical trial study the effect of four positions on arterial blood gases and vital signs in 60 patients, aged 40-60, after coronary artery bypass graft (CABG), who were receiving mechanical ventilation, and selected via convenience sampling

was examined. Arterial blood gas analysis was performed in supine, semi sitting, 30° left and right lateral position after keeping the patients in a given position for 30 minutes. Necessary information's obtained from patients' documents and laboratory results. Data were analyzed by SPSS computer software, version 17 and data were analyzed using repeated measures of ANOVA and Bonferroni test.

After cardiac surgery the patients will be transferred to the ICU. Patients in the first 30 minutes in the supine position (in case of direct head and neck flat on the bed were sick seals Weston and was placed under the head of any means of support) were included.

After this time, an arterial blood sample via arterial catheter that was set in the operating room the patient was taken and vital signs were recorded. For taking arterial blood sample syringe was heparinized after each use blood sample should be analyzed immediately by analyzed with the series 3000 Primer making.

Table (1) was shows that the mean and standard deviation equal to the age of the patients studied 6.07 ± 54.48 respectively.

Table 1: Mean and SD of the subjects based on age

SD	mean	No.	Subjects
6.07	54.48	60	

Table (2) shows that 3.33 percent (n = 20) female patients and 66% (40 patients) were male.

Table 2: Comparison of the frequency distribution of units based on sex

sex	No.	%
F	20	33.3
M	40	66.7
Total	60	100

Table 3: Frequency distribution of units based on marital status

marital status	No.	%
Single	3	5
married	57	95
Total	60	100

3. Result

Statistically significant differences were found in PaO₂ and O₂ saturation averages in different positions (P=0.00). Pao₂ and O₂ saturation values were significantly higher in the left lateral (PaO₂=96.4 ± 28.93 mm. hg, O₂ saturation =95.7 ± 3.32 %) than other positions. But no significant difference was found between BE, HCO₃, PH, PCO₂ averages (P>0.05). Therefore the averages of BE,

Hco₃, PH, PCO₂ were statistically equal in all positions. Results showed significant differences in averages of respiratory rate, temperature and diastolic blood pressure in four positions (P<0.00). Respiratory rate increased in different positions in turn. However respiratory rate was significantly higher in the left lateral position (14.16 ± 1.75) than other positions. No significant difference was found in heart rate and systolic blood pressure (P>0.05).

Therefore the averages of heart rate and systolic blood were equal in all positions.

Table 4: Mean and standard deviation values of arterial blood gases (ABG) in the supine

ABG	No.	Mean	SD
PH	60	7.36	0.05
PCO ₂	60	40.70	5.64
PaO ₂	60	84.57	32.12
HCO ₃	60	22.87	1.99
BE	60	-2.45	2.29
O ₂ saturation	60	92.90	5.38

Table 5: Mean values of arterial blood gases (ABG) in a semi-sitting criterion

ABG	No.	Mean	SD
PH	60	7.36	0.05
PCO ₂	60	40.45	5.57
PaO ₂	60	83.35	29.23
HCO ₃	60	22.89	1.88
BE	60	-2.47	2.21
O ₂ saturation	60	92.93	5.24

Table (8) shows that the average hard and fast criteria PH supine in the 7.36 ± 0.051 , semi sitting position equal to 7.36 ± 0.051 , on the right lateral position 7.36 ± 0.046 and on the left lateral position was equal to 7.37 ± 0.049 .

For PH status analysis techniques at four positions ((ANOVA)) with repeated measures was used. The error 5% was not significant (P>0.05). The PH value was identical with each other in all situations.

Table (9) shows that the average standard PCO₂ in the supine position with 40.70 ± 5.64 , the semi-sitting position with 40.45 ± 5.57 , on the right lateral position with 40.29 ± 4.81 and in position to the left flank with 39.85 ± 4.23 .

Table 6: Average values of measure arterial blood gases (ABG) in the right lateral position

ABG	No.	Mean	SD
PH	60	7.36	0.04
PCO ₂	60	40.29	4.81
PaO ₂	60	91.75	30.42
HCO ₃	60	22.80	2.05
BE	60	-2.53	2.39
O ₂ saturation	60	94.63	3.93

Table 7: Mean arterial blood gas values criteria in the left lateral position

ABG	No.	Mean	SD
PH	60	7.37	0.049
PCO ₂	60	39.85	4.23
PaO ₂	60	96.46	28.92
HCO ₃	60	23.03	2.14
BE	60	-2.20	2.69
O ₂ saturation	60	95.70	3.32

Table 8: Comparison of criteria PH in different situations

PH	No.	Mean	Sd	P Value
Supine	60	7.36	0.051	0.371
Semi-sitting	60	7.36	0.051	
Right lateral	60	7.36	0.046	
The left lateral	60	7.37	0.049	

Analysis techniques at four positions ((ANOVA)) with repeated measures used in significant error was 5% (05.0 (P>.

Table 9: Comparison of standard PCO₂ in different situations

PCO ₂	No.	Mean	Sd	P Value
Supine	60	40.70	5.64	0.371
Semi-sitting	60	40.45	5.57	
Right lateral	60	40.29	4.81	
left lateral	60	39.85	4.23	

Table (10) shows that the average standard fast PaO₂ in the supine positions (84.57 ± 32.1), semi-sitting (83.357 ± 29.23), lying to the right side (96.465 ± 28) and lying to the left side (. 28 ± 465.96). Results of variance analysis (ANOVA) sided with a 5% error in the duplicate values was significant (P≤0.00). Thus, the PaO₂ in all different situations and the amount of lateral position was more than the other conditions (P<0.338).

Table 10: Comparison between the various criteria paO₂

paO ₂	No.	Mean	Sd	P Value
Supine	60	84.57	32.12	0.00
Semi-sitting	60	83.35	29.23	
Right lateral	60	91.75	30.42	
left lateral	60	96.46	28.92	

Table (11) results barge compared to evaluate differences between mean and standard deviation between different states shows, T statistical methods were used.

The Bonferroni method was used to control Type I error. In this way the possibility of significant levels 0.05 were compared.

Between pairs (1 and 2) there is no significant difference. Both conditions were compared barge that significant differences between conditions supine with a semi-sitting position (713.0> P) and lying to the right side (057.0> P) between supine and back, but there is no left side (00.0> P) is significant, and this value is left lateral position.

Compare pairs of semi-sitting position with the lateral position (00.0> P) and lying to the left side (00.0> P) the difference was significant, and this value was higher in the left lateral positions.

The mean PaO₂ between left and right lateral position was a significant difference and the arterial oxygen pressure in the left lateral position was higher.

4. Discussion

Thus, based on research results, the first hypothesis of the study titled "Effects of the supine position, semi-sitting, and lying to the (right and left lateral) positin on arterial blood gas results in different subjects", the parameters PaO₂ and O₂ saturation can be approved.

The results were also observed in the flank position, PaO₂, and O₂ saturation levels of the other conditions were reported (especially the left lateral side) after coronary artery bypass surgery causes further improve oxygenation in these patients and are contraindicated in patients with this condition.

G.D.Puri and colleagues (2005) showed impact on regional lung function has long been of interest to physiologists. Shift is causing changes in respiratory gases. Most favorable exchange between carbon dioxide and oxygen in the Alveolus lungs occurs when the ratio of emissions to air in the tissue is normal and circulation areas with the best ventilation are the best. Placing the patient in side lying position due to increase lung perfusion under gravity was, when the patient is asleep to it. Thus, ventilation and perfusion is increased (4).

Gizella I.Bardoczky Studie (2008) evidence of the effectiveness of status changes on the arterial blood gas values. This research to impact on Fio₂ status in patients with chronic lung during lung surgery was performed. 24 patients were selected randomly and were divided into three groups of 8, respectively Fio₂ with the 0.4, 0.6 and 0.1 received by the ventilator and the conditions placed supine and side sleeping were. Pao₂ was observed that the side

sleeping position to supine position was significantly greater ($p < 0.02$) (5).

G.D.Puri and colleagues (2005) A quasi-experimental study of oxygen changes in patients with valvular heart failure with cardiomegaly in the supine and lateral positions, left and right made in India. This study was prepared on 42 patients who Heart surgery was performed. ABG 15 minutes after exposure the patient was performed in each of the three. During the study, 35 percent received the amount of supplemental oxygen (4).

The results suggest that the arterial oxygen saturation and hemoglobin significantly in the right lateral position:

(PaO₂=120.6±29.5mmhg, SaO₂=98.1±1.4%)

Left lateral:

(PaO₂=109.7±32.0, SaO₂=97.6±1.7% ; mean ±SD; P<0.00)

This study showed that the right lateral posture can increase and improve arterial oxygenation in patients with heart valve disorders, and seems to be operative in this situation would be useful for patients (4).

In N Markou, (2002) that the impact on respiration and gas exchange in patients with the disease, unilateral lung under mechanical ventilation were done, the number of 15 patients, 8 cases of atelectasis, and 7 cases of pneumonia patients in the study participated. Sedating drugs were found in all patients and unconscious. First patients in the supine and lateral position (10 min each) were placed. Eventually it became clear that the side sleeping position to supine significantly increase PaO₂/FiO₂ (from 132.5±19.4 mmhg to 162.5±18.9 mmhg) is ($p < 0.000$) (13).

The study results Tongyoo (2006) also confirm the status of arterial blood gas values. This study aimed to influence supine and lateral angle of 60 degrees on the oxygenation of patients with acute respiratory distress syndrome was performed. In this study 18 patients with acute respiratory distress syndrome with a mean age of 52.5 ± 19.6 to 14 male and 4 female, participated. Results showed that the right lateral position to supine can increase PaO₂ (90.3±29 and 84.6±20.4, P=0.23) (18).

5. Conclusion

Not only change position has negative effect on patient's vital signs and arterial blood gases, but also applying it improves PaO₂, O₂ saturation and respiratory rate. Lateral position (especially left lateral position) improves oxygenation in this patient after coronary artery bypass graft surgery and there is no contraindication to use it.

Table 11: Comparison of mean differences between the two situations studied criteria in Pao₂

Status	Mean differences PaO ₂	Sd	P Value
Couple 1 semi supine, sitting	1.213	25.419	0.713
Couple 2 lying on his back and right lateral	-7.188	28.718	0.057
Couple's 3 lying to the back and left lateral	-11.895	24.250	0.000
Couple 4 semi -sitting, and lying to the right	-8.401	14.575	0.000
Couple 5 semi-sitting and lying to the left side	-13.108	20.751	0.000
Couple 6 left and right lateral	-4.706	16.718	0.033

The results of statistical inference with respect to the second hypothesis of the study titled "Effects of the supine position, semi-sitting, and lying to the side (right and left) on different subjects of vital signs", the respiratory rate, temperature and Diastolic blood pressure is confirmed, but the parameters of systolic blood pressure and pulse rate are rejected.

Results showed that the respiratory rate increased and thus the change in the position to the left lateral side to reach the highest levels.

The study results show that changing of positions are not only negative but also the impact on the overall appearance of arterial blood gases are not critical by placing the patient in different positions, and O₂ saturation in the number of PaO₂ breathing has improved, so that lateral position (especially left lateral) after coronary artery bypass surgery which causes further improve of oxygenation in the patients. Moreover there are no contraindications in use of these positions to coronary artery bypass surgery patients.

Table 12: Comparison of hard and fast criteria for diastolic blood pressure (BP.DAY) in different situations

Diastolic blood pressure	No.	Mean	Sd	P Value
Supine	60	73.53	14.95	0.012
Semi-sitting	60	78.56	15.89	
Right lateral	60	76.78	13.54	
The left lateral	60	74.06	12.77	

Table 13: Comparison of the mean difference in diastolic blood pressure in check hard and fast criteria, two to two conditions

Status	Mean	Sd	P Value
Couple 1 semi supine, sitting	-5.033	12.864	0.004
Couple 2 lying on his back and right lateral	-3.250	15.535	0.110
Couple's 3 lying to the back and left lateral	-0.533	14.042	0.770
Couple 4 semi -sitting, and lying to the right	1.783	13.727	0.318

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