The Effect of Patients Positioning on Oxygen Saturation in the Acute Phase of Ischemic Stroke

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Abstract: Body position is known to influence respiratory function in normal subjects & those with respiratory pathology. Its effect on respiratory function after stroke has received little attention. It's generally thought that stroke morbidity is increased by inappropriate position during early recovery phase. The present study was designed to identify changes in arterial oxygen saturation (SaO_2) associated with different four positions of the patient in order to detect proper position which maintain the optimum level of SaO_2. Quasiexperiment research design was applied in this study. This study was conducted in stroke intensive care unit of Neurological Department of Assuit University Hospitals. The subjects of this study consist of 60 patients with acute ischemic stroke within 48 hours following mild to moderate and sever stroke. Three tools were included in the study, tool of sociodemographic data, tool of the positions and tool of the Scandinavian stroke scale. The result of the present study revealed that there was statistically significant difference between SaO_2 and blood pressure of the patients before and after the positions. It was found also that total mean of SaO_2 during right side, supine and semi-setting position was nearly equal and there was statistically significant difference between left position and 3 other positions. So, the study recommended the importance of changing patient's positions which improve ventilation and blood pressure. The importance of the use of positions tested (Rt. side, supine and semi-setting position) in the clinical practice to maintain SaO_2 in patients of ischemic stroke.

INTRODUCTION

Stroke is the third leading cause of death & adult disability preceded by heart disease & cancer.[1] According to the National Stroke Association stroke is one of the leading causes of permanently disability in adult. American Heart Association estimated that 15 to 20 billion dollars are spent annually on stroke & stroke related disorders.[2] Stroke is a descriptive term for the onset of acute neurological deficit persisting for more than 24 hours & caused by the interruption of blood flow to the brain. Strokes are generally classified as either ischemic or hemorrhagic, while approximately 80% of all strokes are ischemic. Ischemic

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strokes result from low cerebral blood flow usually because of occlusion of blood vessels. The occlusion can be either thrombi or emboli.[1-4] Early recognition & prompt entry into emergency medical system are essential to reduce death & disability from stroke.[2,5] It's generally agreed that hypoxia should be avoided in the acute phase of stroke. Full in oxygenation could affect the vulnerable ischemic brain.[6] Body position is known to influence respiratory function in normal subjects & those with respiratory pathology. Its effect on respiratory function after stroke has received little attention.[6] It's generally thought that stroke morbidity is increased by inappropriate positioning during early recovery phase.[7, 8] Until now, for patients with ischemic stroke no studies to date have evaluated the effect of patients positioning on stroke out come.[9,10] Although there are no data from standardized studies, moderate elevation of the head is standard practice in most institutions.[10] However, one study suggests the some positions used in clinical practice may adversely influence respiratory function. That Study aimed at identifying effect of these positions to maintain arterial oxygen saturation (SaO_2) at optimal level and changes in SaO_2 during time spent in the test positions. The study reported that there were no changes in SaO_2 across the hour spent in each position and no differences in SaO_2 were identified among positions.[5] It's clear from the researches that few which were directed specifically toward positioning, the patient with ischemic stroke which reflects the need for further research to supplement the present body knowledge. Hence this study was designed to identify changes in SaO_2 associated with different position of the patients in order to detect proper positioning which maintains the optimum level of SaO_2.

AIM OF THE STURY

1- To identify changes in arterial

Oxygen saturation (SaO_2) associated with different positions of the patients

2- To detect proper position which maintains the optimum level of SaO_2.

MATERIAL and METHODS

Design: Quasiexperimental research design was adopted for this study. **Setting:** The study was carried out in the stroke intensive care unit of Neurological Department of Assuit University Hospital.

Subjects: Convenient sample of 60 patients were included in this study. The subjects were eligible for the study if they had first anterior circulation acute ischemic stroke within 48 hours following mild to moderately & sever stroke.

Exclusion criteria:

1- Patients with hemorrhagic stroke

2- Patients with organ failure (hepatic, renal & cardiac disease)

3- Uncooperative patients

4- Patients with severe chest infection

5- Patients with recent myocardial infarction

Tools: three tools were developed for data collection: Tool of socio-demographic data (age, sex, marital status & level of education)

Tool of positions **:** in this tool blood pressure & SaO_2 were recorded before & after positions, SaO_2 was recorded in this tool each 15 minutes during hour spent in semi-setting, supine, right side & left side position.

Tool of the scale**:** Scandinavian stroke scale tool[11] to assess neurological status of patient with ischemic stroke with total score of (58).

This scale composed of 9 items:

The first one for assessment of level of consciousness with score (6-4-2). The 2nd item for assessment of orientation with score   (6-4-2-0). The 3rd item related to assessment of eye movement with score (4-2-0). The 4th item for assessment of facial palsy with score (2-0). The 5th item for assessment of arm motor power with score   (6-5-4-2-0). The 6th item for

assessment of hand motor power with score (6-4-2-0). The 7th item for assessment of leg-motor power with score of (6-5-4-2-0). The 8th item for assessment of gait with score (12-9-6-3-0). The last 9th item for assessment of speech with score (10-6-3-0).

Methods

- Permission to conduct the study was taken from hospital responsible authorities after explanation of the aim of the study.

- Data collection tools were developed based on review of relevant literature.

- The study tools were revised by 5 experts in the field of nursing & neurology to test content validity & clarity. Necessary modifications were done.

- A pilot study was conducted on 5 patients not included in the study to test feasibility of the tool.

- All patients included in the study were informed about the aim of the study &

all of them gave informed consent before engaging in the study if possible.

- In this study, each patient was put in four positions (semi-setting, supine, right side & left side position)

- Before putting the patient in any position, blood pressure & SaO_2 were measured and recorded in tool number (2).

- The patients still in each position for one hour, during this hour SaO_2 was measured & recorded every 15 minutes in that hour.

- After finishing from the four positions the blood pressure & SaO_2 were measured & recorded also in tool number (2).

- After that neurological status of each patient. was assessed by using Scandinavian scale through observation & interview of the patient if possible.

Statistical analysis

Data were analyzed using SPSS, version 11-5. A p value of 0.05 was used for statistical significance and all tests were two sided. The arithmetic mean, standard deviation & percentage were used as summary statistics. Comparison among proportion was performed using T-test, correlation & regression with exact p values.

RESULTS

A total of 60 patients were enrolled in this study:

Table (1) & figure (1) show the sociodemographic characteristics of the study sample, The mean age of the patients was (54.416) years, while more than half of the patients (58%) were males & (42%) were females. It was apparent from this table also that majority (86.67 %) of the patients were married & the highest proportion (75%) of the patients were illiterate or just know how to read & write.

Table (2) & figure (2) illustrated the distribution of the studied sample according to means of blood pressure & SaO_2. The Table and Figure indicate that the mean of the blood pressure and SaO_2 of the patients before starting the positions were (142± 23.412, 86.5±11.472 & 94.36±3.0 89, respectively) which improve to (131.67±20.380, 81.667±17.434 & 95.6±2.216) after finishing from study positions. This table showed also that there were statistically significant difference between means of the blood pressure and SaO_2 of the patients before & after positions.

Table (3) & figure (3) review the distributation of the studied sample according to mean of SaO_2 during hour spending in each position. It was found that mean of SaO_2 in the last 15 minutes of the hours was the highest mean in the majority of the positions. It was clear from the table also that total mean of SaO_2 during hour spending in each position in the right side, supine & semi sitting position was nearly equal.

Table (4): shows the significant difference between positions. It was found that there were statistical significant differences between left position & the three other positions (right side, supine & semi-sitting position)

Table (5): illustrated distribution of the study sample according to mean score of Scandinavian stroke scale.

The table reviews that the mean scores of level of consciousness, orientation, eye movement & facial palsy of the studied sample were (3.11 ±1.438, 2.433 ± 1.807, 2.1 ± 1.537, and 1.1 ±1.003, respectively). While in arm, hand, leg motor power, gait & speech, mean scores of the studied group were (3.3 ±1.7, 2.6 ± 1.7, 2.2 ± 1.7, 2 ± 3.2, and 3.3 ± 2.9, respectively).

It was clear from the table also that mean score of the all items of the scale was very poor in comparison to total score.

Table (6): shows correlation between positions & Scandinavian stroke scale. It was found that there were statistical significant differences between left side, and supine position & level of consciousness & between left side position & hand motor power.

It was noticed also that there were statistically significant differences between the right side position and supine position & gait item.

Table (1) Distribution of the studied sample according to their socio-demographic characteristics, number = 60 patients

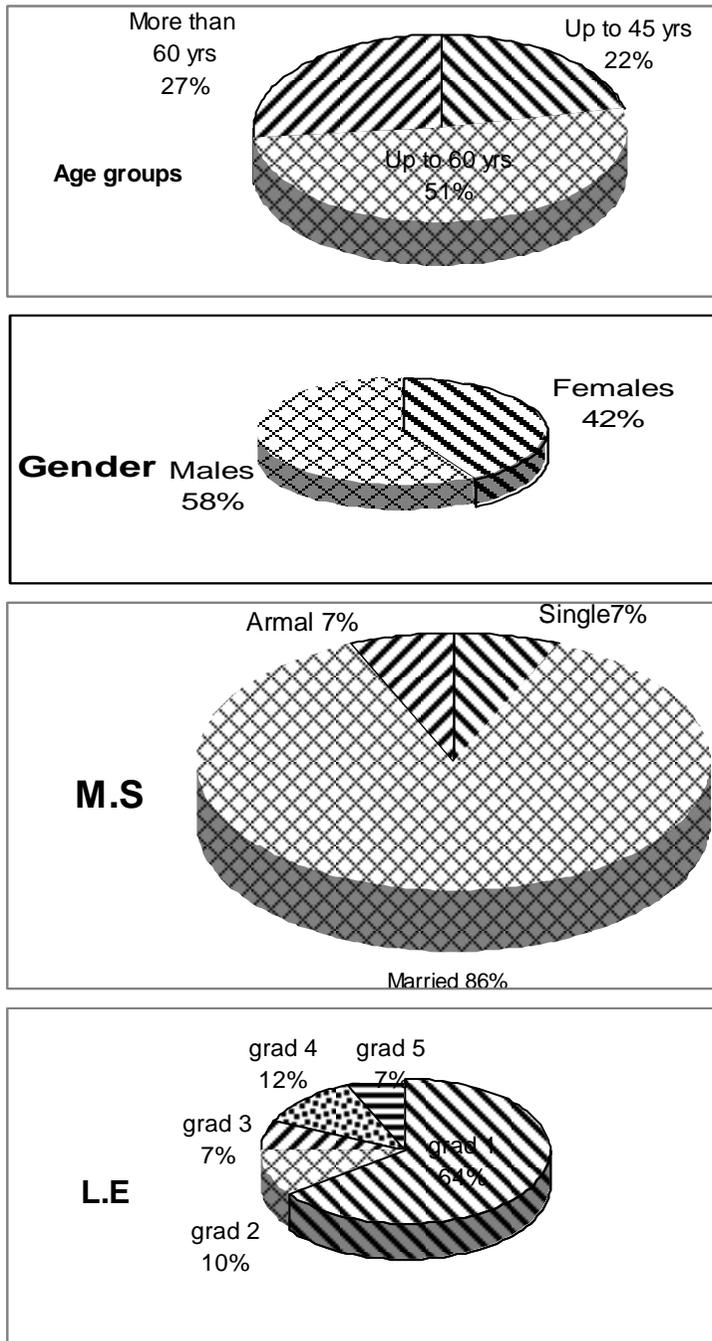| Variables	Frequency	%	Mean +SD
Age	-	-	54.416+10.722
Sex			
Male	35	58	
Female	25	42	
Marital status			
Married	52	86.67	
Unmarried	8	13.33	
Level of education			
Illiterate	39	65	
Read & write	6	10	
Primary/prep school	11	18	
Secondary school	4	7	

Figure (1) Distribution of the studied sample according to their socio-demographic characteristics.

Table (2): Distribution of the studied sample according to blood pressure
& SaO2 before & after positions

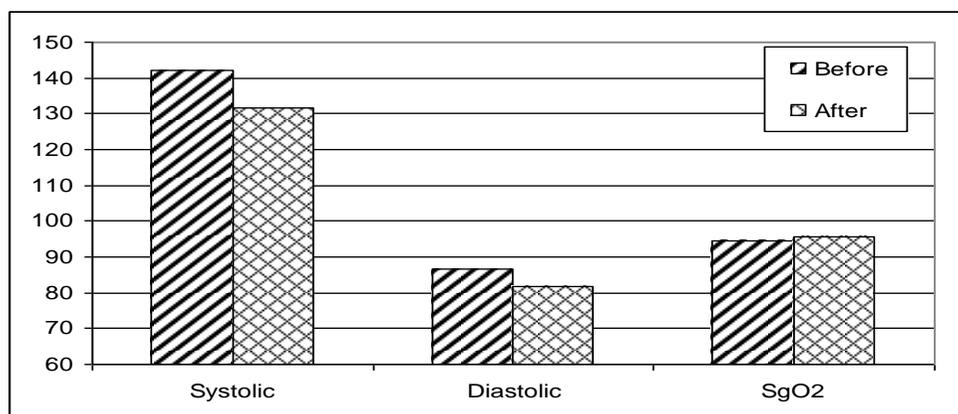| Variable	Before positions Mean +SD	After positions Mean +SD	Significance
Blood pressure			
a- Systolic	142+23.412	131.67+20.80	T value ** 3.96 p.0.002
b- Diastolic	86.5+11.472	81.667+17.434	T value ** 3.74 p.0.004
SaO2	94.36+3.089	95.6+2.216	T value ** 4.65 P .0.001

Figure (2) distribution of the studied sample according to blood pressure &
SaO$_2$ before & after positions

Table (3) Distribution of the studied sample according to mean of SaO$_2$ during hour
spending in each position.

Positions	1st 15 minutes of the hour	2nd 15 minutes of the hour	3rd 15 minutes of the hour	4th 15 minutes of the hour	Total hours
Rt. side	94.633± 2.767	94.4±2.775	94.733±2.510	94.95±2.324	94.688±2.449
Supine	94.833 ±3.o3	94.8±2.113	94.786±2.082	94.9±2.242	94.683±2.066
Semi-setting	94.2±2.660	94.366±2.916	94.466±2.632	94.05±2.324	94.296±2.454
Left side	93.833±2.756	93.25±3.457	93.25±3.457	93.466±3.088	93.479±2.874
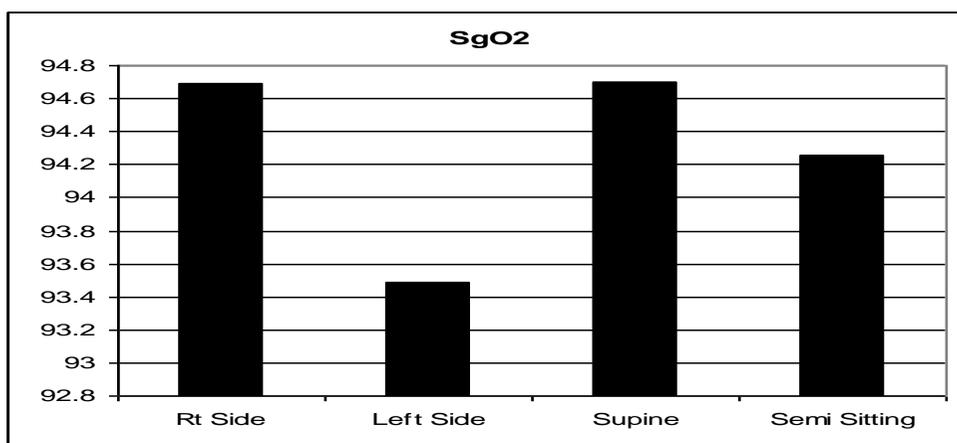
Figure(3) Distribution of the studied sample according to mean of SaO_2 during hour spending in each position

Table (4) Significance differences in SaO_2 between positions

Positions	Rt side (94.69)	Left side (93.48)	Supine (94.68)
Left side (93.48)	T value, p 3.55 0.0008**		
Supine (94.68)	0.69 0.493 ns	3.57 0.0007**	
Semi-sitting (94.29)	1.75 0.085 ns	2.25 0.028*	1.02 0.31 ns

Ns = non-significant
* =significant
** = highly significant

Table (5) Distribution of the study sample according to score of Scandinavian stroke scale .

Items of scale	Mean +SD
Consciousness (6-4-2)	3.114 ±1.438
Orientation (6-4-2-0)	2.433 ±1.807
Eye movements (4-2-0)	2.1±1.537
Facial palsy (2-0)	1.1±1.003
Arm, motor power (6-5-4-2-0)	3.383 ±1.747
Hand motor power (6-4-2-0)	2.683 ±1.747
Leg motor power (6-5-4-2-0)	2.233 ±1.681
Gait (12-9-6-3-0)	2.0 ±3.204
Speech (10-6-3-0)	3.283 ± 2.888
Total score -58	22.183 ± 12.09

Table (6) Correlation between positions & Scandinavian stroke scale .

Positions	Items of the scale								
	Consciousness	Orientation	Eye movement	Facial palsy	Arm motor power	Hand motor power	Leg Motor power	gait	Speech
Rt. side	0.15 ns	0.07 ns	0.12 ns	0.08 ns	0.33 ns	0.64 ns	0.31 *	0.09 **	0.45 ns
Left side	0.28 *	0.10 ns	0.20 ns	0.49 ns	0.44 ns	0.67 **	0.14 ns	0.33 ns	0.62 ns
Semi-setting	0.12 ns	0.56 ns	0.69 ns	0.72 ns	0.42 ns	0.47 ns	0.27 ns	0.33 ns	0.33 ns
Supine	0.27 *	0.16 ns	0.41 ns	0.64 ns	0.70 ns	0.75 ns	0.27 ns	0.05 *	0.53 ns

Ns = not significant   * Significant at 5%
** Significant at 1%

DISCUSSION

Body position is known to influance respiratory function in normal subjects & those with respiratory pathologists. Its effect on respiratory function after stroke has received little attention.[6] It is generally thought that stroke morbidity is increased by inappropriate position during early recovery phase [7,8]. So the present study tried to identify changes in SaO_2 associated with different four positions of the patient in order to detect proper position which maintains the optimum level of SaO_2. The present study revealed that mean age of the patient was 54.416 ± 10.722, while more than half of the patients were males. This result may be attributed to that males were more smoker, more stressfull & have more high cholesterol than females. The results of the present study were in line with study done by Schwarz, *et al.*, [10] on the effect of body position on cerebral perfusion in patients with stroke, who stated that mean age of the patients was 61.2 years while more than half of the patients were males. Also study done by stroke information of the

patient family [12] who mentioned that 28% of people suffer stroke in given year are under age of 65 years. While Hicks[13] who stated that stroke can affect people of any age. Nine out of ten stroke occur in people over the age of 55 years. Hicks mentions also that men are more often affected by stroke than women. The present study demonstrated that the highest proportions of the patients were illiterate or can read & write. This level of education may be a barrier to complaine with treatment and awareness of the warning signs of the stroke.

So a primary public health should focus on increased the awareness of the stroke symptoms particularly among people at high-risk to decrease delay in early detection & effective stroke treatment.

The current study revealed that blood pressure & SaO_2 of the studied sample after finishing from position were better than blood pressure & SaO_2 before starting positions. There were statistical significant differences between blood pressure & SaO_2 before & after positions. This result may be attributed to change of body positions can improve circulation & ventilation.

Changing position can improve oxygenation by improved ventilation perfusion matching & prevention of complication[14-15]. Study done by Schworz, *et al.,*[10] on the effect of body positions on cerebral perfusion in patients with stroke, mention that baseline mean arterial pressure of the patients was 90.0±1.6 mm/hg & fell to 82.7±1.7 mmhg at 15 degrees & 79.1±1.6 mm/hg at 30 back rest elevation. Pugh *et al.,*(2004) mentioned that it's important to monitor blood pressure frequently during the acute phase of the stroke.[3]

Yeaw (1992)[16] mentioned that before any position change of the stroke patient, assess the patient to determine baseline data as respiration, blood pressure, mental status & SaO_2 to evaluate the effect of the

position, change by comparing your findings before & after change of position to your base line assessment.

It was clear from the results of the present study that the highest mean of SaO_2 of the study subject during total hours spent in the position, was in the right side followed by supine position & semi-setting position & it was noticed that differences between means of SaO_2 in the three mentioned positions were very little & there was statistically significant difference between left side position & these three mentioned positions.

While study done by chalterton, *et al.,* (2000)[6] who reported that mean SaO_2 values for all patients were > 90 for the hour spent in each test position. For all patients there were no changes in SaO_2 across the hour spent in the test position difference in SaO_2.

Study done by Brainin[17] who tested the safety of positioning the stroke patient on the left side versus right side. Brainin

measured oxygen saturation, breathing rate, blood pressure, pulse, & ECG on 18 patients with stroke. There were no significant differences seen in any measurement comparing the two positions. No decrease in SaO_2 was found over the course of the test for either positions.

Study done by Schworz *et al.,* (2002)[10] on the effect of body position on cerebral perfusion in stroke patients, revealed that cerebral perfusion was highest in the flat position (77.0 ± 1.8 mm/hg) & decreased to 70 .0 ± 1.8 mm/hg at 15 further to 64.7 ± 1.7 mm/hg at 30 perfusion return to base line value (77.2±1.8 mm/hg) at the end of the protocol.

It was noticed from the results that scores of the studied patients as regard Scandinavian scale were very poor in comparison to total score. This may be due to the condition of the patients in early recovery phase was unstable.

The neurological scale which was used

as standardized measure of neurological function & stroke severity. Is a scored assessment tool that identifies neurological deficits [3].

The patient with stroke should be assessed using the stroke scale to evaluate neurological deficits & is useful in differentiation between ischemic stroke & transient ischemic attack. [5]

CONCLUSION

In the light of the present study finding it might be concluded that:

1- There was statistical significant difference between blood pressure & SaO_2 before & after study positions.

2- Total mean of SaO_2 during hour spent in the right side, supine & semi- setting position nearly equal, & there was statistical significant difference between these positions & left side position.

3- It was noticed also that there were statistically significant differences between the right side position, supine

position and the item of (gait) of Scandinavians stroke scale.

RECOMMENDATIONS

1- Patients with ischemic stroke in the early stage of the disease, their positions should be changed periodically to improve their condition as regard ventilation & blood pressure.

2- The positions tested especially (Rt.side, supine & semi-sitting position) may be recommended for use in the clinical practice, to maintain arterial oxygen saturation in patient in the first 48 hours following mild to moderate & sever stroke.

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