THE EFFECT OF RIGHT LATERAL POSITION ON HEMODYNAMICS AND COMFORT PATIENTS WITH HEART FAILURE: *A RANDOMIZED CONTROLLED TRIAL*

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Abstract

Benefits of right lateral position on patients with heart failure has been widely studied, but it is still unclear the effects of right lateral position on hemodynamics of patients with heart failure. This study aims to identify the effect of right lateral resting position on hemodynamic and level of comfort on heart failure patients. The method of this research was randomized controlled trial (RCT) withcross – over design. Twenty patients with heart failure stage II and III (15 men and 5 women) at the Harapan Kita Cardiovascular Hospital were participated. Blood pressure, Mean Arterial Pressure (MAP), heart rate (HR), respiratory rate (RR) and SaO2 were measured before and after setting up the position using bedsite monitor.The level of comfort was measured by using the Verbal Rating Scale Questionnaire. Measurements were taken in the morning (09:00 to 11:00 AM) and evening (04:00 to 06:00 PM). The results of this study showed there are significant effects of right lateral position on the Systolic Blood Pressure (SBP) (Morning: p value .000; Evening: p value: .017), Diastolic Blood Pressure (DBP) (Morning: p value 0.004), MAP (Morning: p value 0.001), HR (Evening: p value 0.008) before and after setting up the right lateral position. There is a significant difference between group on the level of comfort (Evening: p value 0.041). Recommendation of this study is setting the right lateral position can used as one of nursing intervention for maintain hemodynamic and increase level of comfort on patients with heart failure.

Keywords : right lateral, hemodynamic, comfort, heart failure

BACKGROUND

Heart disease is disease that attacks many people, but less people know quickly, whereas this problem can be a major cause of death compared with seven other diseases. WHO also noted that there are 17.5 million people died from heart disease in 2005 and predict these numbers will increase up to 20 million in 2015, including in Indonesia (Keputusan Menteri Kesehatan Republik Indonesia, 2009). Heart failure causes the ineffectiveness of pumping blood around the body. Artery does not carries oxygen and nutrients to vital organs such as kidneys and brain and peripheral tissues, thus resulting in decreased organ function (Price & Wilson, 2006; Ignatavicius & Workman, 2010; Sherwood, 2012).

One of the nursing interventions that can be done is setting position. Research shows that the right lateral position has

many benefits for patients with heart failure. Fujita, Miyamoto, Sekiguchi, Eiho dan Sasayama (2001) says the right lateral position is recommended in patients with Congestive Heart Failure (CHF). Giving the right lateral position effect on QT dispersion decrease in patients with heart failure (Sakamoto *et al*, 2004), improve arterial oxygenation in patients with valvular heart disease and enlarged left ventricular patients with heart failure avoid spontaneous sleep in left lateral position (Leung, Bowman, Parker, Newton & Bradley, 2003).

Right intervention expected can improve level of comfort heart failure patients (Kolcaba, 2003). Right lateral position does not be applied in Indonesia, especially in RSJPDHK because still unclear evidence that examines the effect of setting the right lateral position of the hemodynamic patients with heart failure. Based on this there should be research on the effect of setting right lateral the resting position and comfort hemodynamic changes in patients with heart failure.

The purpose of this study is to identify the effect of right lateral resting position on hemodynamic and level of comfort on patients with heart failure.

METHODS

The method of this research was a randomized controlled trial (RCT) with a cross – over design. Respondents get the settings right lateral position and semi-fowler for 10 minutes. Carry-over effects are minimized by wash out period for 5 minutes. Before and after setting the position measurements were taken of hemodynamic (blood pressure, MAP, HR, RR and SaO2) using bed site monitor and measure the level of comfort using the Verbal Rating Scale Questionnaire. The study was conducted two times a day in morning (09:00 to 11:00 am) and afternoon (04:00 to 06:00 pm).

Inclusion criteria for this study were patients with heart failure stage II and III, do not use ventilator, there is no contra indications for right lateral position, such as postoperative abdominal or thoracic, spinal injuries and fractures. Before conducting the study, researchers explained to the respondents of the research procedures first.

Analysis of hemodynamic differences before and after the intervention on each group using paired t test, while the differences between the mean hemodynamic changes after intervention between groups, the mean difference between groups hemodynamic

and level of comfort on each group using independent t - test.

RESULTS

Twenty subject patients with heart failure stage II and III (15 men and 5 women) at the Harapan Kita Cardiovascular Hospital were participated, and average of age was 55.1 years old, ACE inhibitors (morning: 11; evening: 7), Beta blockers morning: 16; evening: 5, inotropic (morning: 6; evening: 0) and diuretics (morning: 18; evening: 17). Use of oxygen (morning: 2; evening: 3) and Hb 12.7 g / dl.

SBP measurement results, DBP morning, MAP and heart rate in the morning before the afternoon and after setting the position of the heart failure patients showed a significant effect, while in the afternoon DBP measurements, MAP afternoon, morning heart rate, breathing frequency and SaO2 before and after setting position in patients with heart failure there is no significant change in hemodynamics (Table 1).

Table 1. Hemodynamic differences between the mean before and after setting positions on each group (N = 20)

Variable	Group	Measurements	Morning			Evening		
			Mean ± SD	Mean diff (95% CI)	p *value*	Mean ± SD	Mean diff (95% CI)	p *value*
SBP	I	Pre	98.15 ± 13.93	5.05 (2.57;7.53)	.000*	101.00 ± 18.64	5.15 (1.04; 9.26)	.017*
		Post	93.10 ± 11.60			95.85 ± 18.44		
	C	Pre	105.05 ± 18.53	0.85 (-1.39; .09)	.437	110.55 ± 18.41	-0.25 (-5.78; .28)	.926
		Post	104.20 ± 17.81			110.80 ± 20.28		
DBP	I	Pre	61.40 ± 10.54	3.6 (1.29; 5.92)	.004*	58.80 ± 11.59	1.25 (-0.84; .34)	.226
		Post	57.80 ± 8.97			57.55 ± 11.46		
	C	Pre	69.25 ± 15.43	4.05 (-1.18;9.28)	.121	68.45 ± 13.35	0.9 (-1.88; .68)	.505
		Post	65.20 ± 12.16			67.55 ± 12.15		
HR	I	Pre	76.80 ± 10.14	1.8 (-0.03;3.63)	.053	78.50 ± 9.07	1.85 (0.53; 3.17)	.008*
		Post	75 ± 8.94			76.65 ± 9.343		
	C	Pre	73.55 ± 9.53	-5.45 (-9.98;-.92)	.021*	76.25 ± 11.125	-1.6 (-5.55; .35)	.407
		Post	79 ± 12.26			77.85 ± 10.469		
RR	I	Pre	22.05 ± 2.58	0.35 (-0.67;1.37)	.482	21.45 ± 2.625	0.65 (-0.14;1.44)	.103
		Post	21.70 ± 3.45			20.80 ± 2.016		
	C	Pre	21.70 ± 3.37	0.6 (-0.75;1.95)	.365	22.90 ± 4.038	2.15 (0.98;3.32)	.001*
		Post	21.10 ± 3.19			20.75 ± 3.782		
MAP	I	Pre	74.30 ± 11.34	4.15 (1.98; 6.32)	.001*	74.00 ± 14.451	2.5 (-0.63;5.63)	.110
		Post	70.15 ± 9.46			71.50 ± 15.087		
	C	Pre	78.50 ± 14.16	0.65 (-2.53; .83)	.673	82.50 ± 16.735	1.3 (-1.78;4.38)	.388
		Post	77.85 ± 14.53			81.20 ± 13.105		
SaO2	I	Pre	97.15 ± 1.84	-0.55 (-1.24; .14)	.110	96.90 ± 1.553	-0.2 (-0.92;0.52)	.569
		Post	97.70 ± 1.68			97.10 ± 1.997		
	C	Pre	97.15 ± 1.87	-0.35 (-1.00;0.30)	.273	96.95 ± 1.605	-0.35 (-.81;0.110)	.130
		Post	97.50 ± 1.32			97.30 ± 1.342		

* Signifikan in α = 0.05

There are significant differences in the hemodynamic measurements of SBP, DBP and MAP in the evening after setting position between groups. There were no significant differences in hemodynamic measurements MAP in the morning, heart rate, respiratory rate and SaO2 after setting position between groups (Table 2).

Table 2. Hemodynamic mean difference after setting positions between groups (N = 20)

Variable	Morning			Evening		
	Mean diff (95%CI)	t	p *value*	Mean diff (95% CI)	t	p *value*
SBP	-11.1(20.72 ; -1.48)	-2.3	.025*	-14.95(-27.36 ; -2.54)	-2.4	.020*
DBP	-7.4 (14.24 ; -0.56)	-2.2	.035*	-10(17.56 ; -2.44)	-2.7	.011*
HR	-4.0(-10.87 ; 2.87)	-1.2	.246	-1.2(-7.55 ; 5.15)	-0.4	.704
RR	0.6(-1.53 ; 2.73)	0.6	.572	0.05(1.89 ; 1.99)	0.1	.959
MAP	-7.7(-15.55 ; 0.15)	-2.0	.054	-9.7(-18.75 ; -0.65	-2.2	.036*
SaO2	0.2(0.77; 1.17)	0.4	.679	-0.2(-1.29 ; .89)	-0.4	.712

* Signifikan in α = 0.05

Hemodynamic difference in average measurements in the morning and afternoon heart rate and respiratory rate before and after the setting position between groups showed a significant difference, whereas the hemodynamic difference in the average measurements of the SBP, DBP, MAP, HR evening, RR morning and SaO2 before and after the setting position between groups showed no significant differences (Table 3).

The results of the analysis level of comfort after setting the position of the intervention and control groups can be seen in (Table 4).

Table 3. The mean difference hemodynamic before and after setting the position of the group (N = 10)

Variable	Group	Morning				Evening			
		Mean ± SD	Mean diff (95% CI)	t	*p value*	Mean ± SD	Mean diff (95% CI)	t	*p value*
TDS	RL	5.05±5.30	4.2	2.69	.012*	5.15±8.78	5.4	1.507	.109
	SF	.85 ± 4.78	(0.96;7.43)			-.25±11.81	(-1.26;12.06)		
TDD	RL	3.60 ± 4.9	1	-0.16	.870	3.75±10.58	2.85	1.050	.300
	SF	4.05±11.1	(-4.6;6.6)			.90 ±5.92	(-2.64;8.34)		
Denyut jantung	RL	1.80±3.90	7.25	3.109	.005*	1.85 ±2.81	3.45	1.736	.091
	SF	-5.45±9.6	(2.45;12.05)			-1.60±8.43	(-0.57;7.47)		
Frek nafas	RL	.35 ±2.18	-0.25	-.309	.759	.65 ±1.69	-1.5	-2.222	.032*
	SF	.60 ±2.89	(-1.89;1.39)			2.15 ±2.49	(-2.87;-0.13)		
MAP	RL	4.15±4.63	3.5	1.905	.064	2.50 ±6.67	1.2	.572	.571
	SF	.65 ±6.78	(-0.22;7.22)			1.30 ±6.58	(-3.05;5.45)		
SaO2	RL	-.55 ±1.46	-0.2	-.443	.660	-.20 ±1.54	0.15	.366	.716
	SF	-.35 ±1.38	(-1.11;0.71)			-.35 ±.98	(-0.68;0.98)		

* Signifikan in α = 0.05

Table 4. The difference in level of comfort between each group after setting position

Time	Group	Mean ± SD	Mean diff (95% CI)	t	*p value*
Morning	Right Lateral	6.55 ±1.191	0.4 (-.51 ; 1,31)	.886	.381
	Semi fowler	6.15 ±1.631			
Evening	Right Lateral	7.10 ±1.165	0.95 (.04 ; 1.87)	2.119	.041*
	Semi fowler	6.15 ±1.631			

* Signifikan in α = 0.05

DISCUSSION

The study consist of 20 respondents, it is average age of 55.1 years (18-77 years). The incidence of heart failure is no longer just attacking advanced adulthood. This situation occurs because the cause of heart failure is associated with poor lifestyle such as smoking, eating - foods high in fat and salt. In addition there is a congenital or acquired valve disfunction due to infection with potential heart failure (Black & Hawks, 2009; Smeltzer & Bare, 2010).

Responden in this study consist of 15 male (75%). The assumption of this research is caused by factors that can be modified to cause the risk of heart failure such as smoking, excessive physical activity, stress, alcohol consumption. Eisenberg (2010) explain the risk factors for heart failure were hypertension (64.9%), dyslipidemia (45.05%), diabetes (34.4%) and smoking (5.3%).

Nicotine in cigarettes can speed up the process narrowing and blockage of blood vessels. This blockage can occur in coronary arteries that carry oxygen to the heart. Stress can increase vasoconstriction of blood vessels, increases heart rate and stimulates the release of renin which can lead to increased blood pressure.

Basic mechanisms the effects of setting the position of the right lateral in blood pressure is when lying on the right lateral position, the position of the heart will be higher and the anatomical position of the right atrium causing venous return from the superior and inferior vena cava is more profitable when lying to the right so that the workload the heart is reduced (Gordon, Jones, Sealey & Buettner, 2011; Jain, 2013) in addition when lying right lateral can increase the activity of the vagus nerve (Miyamoto et al, 2001).

The effects of a decrease in sympathetic nerve activity is the reduction in heart rate (Miyamoto, Tambarana, Tamaki, Nagaya, Hasegawa, Nohara, Miwa and Fujita, 2002). Sympathetic nerve works antagonis with parasympathetic nerves (Kishi, 2012; Gayton & Hall, 2008). Increased vagal nerve activity is a condition that is safe and easy, this is a physiological maneuver that should be applicable and beneficial in patients with heart failure (Chen & Kuo, 1997).

Central of respiratory is located in the central nervous system of the brain stem, in addition there are other things that help the process of respiration. Signal - sensory nerve signals located on the walls of the bronchi and bronchioles muscles that continue the signals through the vagus

nerve may also affect the respiratory frequency (Gayton & Hall, 2008). Right lateral position can stimulate the vagus nerve that vagal nerve modulation is higher than the other positions (supine, left lateral, pronation) (Banasik & Emerson, 2001; Yang, Chen & Kuo, 2008).

Gravitational effects caused when the right lateral position also affect the results of blood analysis (Puri, Dutta, Chinnan, Thingnam, Sharma & Chari, 2005). Gravity will affect the distribution of ventilation and perfusion lung directly, so the ventilation - perfusion will be met adequately. Oxygen exchange is strongly influenced by cardiac output and oxygen-carrying hemoglobin (Gayton & Hall, 2008). If the cardiac output in normal circumstances but there is no substance that carries oxygen to the tissues it will result in a decrease in oxygen levels in the blood, and vice versa although the substance that carries oxygen available in the blood vessels, but if the cardiac output is reduced this will also lead to non-compliance tissue oxygen. This causes the SaO2 is not affected by the setting position (Jones & Dean, 2004).

Effect settings right lateral position can be decrease venuos return so that this position is more favorable in patients with heart failure (Leung, Bowman, Parker, Newton & Bradley, 2003; Gordon, Jones, Sealey & Buettner, 2011). Right lateral position contribute in reducing preload and decrease sympathetic nerve activity. Stimulation of the sympathetic nerves will cause a relaxation response, while the characteristic relaxation response that arises as a drop in blood pressure, pulse, muscle relaxation, sleep. The relaxation response is makes improve levels of comfort patient with heart failure when right lateral position (Puri, Dutta, Chinnan, Thingnam, Sharma & Chari, 2005).

CONCLUSION

Right lateral position has been showed effective in lowering blood pressure and increase the comfort on patients with heart failure, so it can be used as a recommendation to be used as an alternative nursing interventions.

Recommendations for further research on the effect of the lateral position on patients with heart failure stage I and IV as well as in patients with other cardiopulmonary disorders such as in patients with CAD, ACS, post cardiac surgery. Research by the number of respondents for more, more specific criteria, long time and frequency and compare with others body position and use a more specific measurement tools that produce a more comprehensive study.

REFERENCES

Banasik, J.L., & Emerson, R.J. (2001). Effect of lateral positions on tissue oxygenation in the critically ill. Heart & Lung: The Journal of Acute and Critical Care, Volume 30, Issue 4, July–August 2001, Pages 269-276. Retrieved from http://www.sciencedirect.com/science/article/pii/S0147956301363495

Black, J.W., & Hawks, J.H. (2009). *Medical surgical nursing : clinical managenent for positive outcome, vol 2. 8ed. Singapore: Elsevier Saunders.*

Chen, G. Y., & Kuo, C. D. (1997). The effect of the lateral decubitus position on vagal tone. *Anaesthesia (52), pages 653 – 657.* Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2044.1997.114-az0106.x/pdf

Eisenberg, S. A., Shen, B. J., Schwarz, E. R., & mallon, S. (2012). Avoidant coping moderates the association between anxiety and patient - rated physical functioning in heart failure patients. *Journal of Behavioral Medicine*, 35(3), 253-261. doi: http://dx.doi.org/10.1007/s10865-011-9358-0

Fujita, M., Miyamoto, S., Sekiguchi, H., Eiho, S & Sasayama, S. (2001). Effects of posture on sympathetic nervous modulation in patients with chronic heart failure. *The Lancet , Vol 356 , 1822-1823*. Retrieved from http://www.sciencedirect.com/science/article/pii/S0140673600032402

Gayton, A. C & Hall, J. E. Alih bahasa Irawati, dkk. (2008). Buku ajar fisiologi kedokteran (Edisi 11). Jakarta: EGC.

Gordon, S., Jones, A., Sealey, R., Buettner, P. (2011). Body position and cardio-respiratory variables in older people. *Archives of Gerontology and Geriatrics 52 (2011) 23–27.* Retrieved from http://www.sciencedirect.com/science/article/pii/S016749430900274X

Ignatavicius, D.D., & Workman, M. L. (2010). *Medical Surgical nursing: patient centered collaborative care vol:2, 6ed*. USA: Saunders Elsivier.

Jain, S. (2013). Effects of right lateral position of body on cardiovascular parameters. *International Journal of Physiology, 1(2), 122-124.* Retrieved from http://search.proquest.com/docview/1462852512?accountid=17242

Jones, A., & Dean, E. (2004). Body position change and its effect on hemodynamic and metabolic status. *Heart & Lung: The Journal of Acute and Critical Care, Volume 33, Issue 5, September–October 2004, Pages 281-290, ISSN 0147-9563,* http://dx.doi.org/10.1016/j.hrtlng.2004.04.004.

Keputusan Menteri Kesehatan Indonesia. (2009). Pedoman pengendalian penyakit jantung dan pembuluh darah, No. 854/MENKES/SK/IX/2009. Retrieved from http://www.hukor.depkes.go.id/up_prod_kepmenkes/KMK%20No.%20854%20Tahun%202009%20ttg%20Pengendalian%20Penyakit%20Jantung.pdf

Kishi, T. (2012). Heart failure as an autonomic nervous system dysfunction. *Journal of cardiology*

(2012) 59, 117 – 122. Retrieved from http://www.sciencedirect.com/science/article/pii/S1054880711001529

Kolcaba, K. (2003). *Comfort theory and practice: a vision for holistic health care and research*. New York: Springer Publishing Company.

Leung, R. S. T ,. Bowman, M. E ,. Parker, J. D ,. Newton, G. E & Bradley, T. D. (2003). Avoidance of the left lateral decubitus position during sleep in patients with heart failure: Relationship to cardiac size and function. *Journal of the American College of Cardiology, Vol. 41, No. 2*. Retrieved from http://apps.webofknowledge.com/full_record.do?product=WOS&search_mode=Refine&qid=9&SID=Z126GnogAmh@AGcAL6g&page=1&doc=4&cacheurlFromRightClick=no

Miyamoto, S., Fujita, M., Seckiguchi, H., Okano, Y., Nagaya, N., Ueda, K., Tamaki, S., Nohara, R., Eiho, S., & Sasayama, S. (2001). Effects of Posture on Cardiac Autonomic Nervous Activity in Patients With Congestive Heart Failure. *Journal of the American College of Cardiology, Vol. 37, No. 7, 2001, page 1788 – 93*. Retrieved from http://content.onlinejacc.org/article.aspx?articleid=1127230

Miyamoto, S., Tambara, K., Tamaki, S., Nagaya, N., Hasegawa. K., Nohara, R., Miwa, K., & Fujita, M. (2002). Effects of Right Lateral Decubitus Position on Plasma Norepinephrine and Plasma Atrial Natriuretic Peptide Levels in Patients With Chronic Congestive Heart Failure. *The American Journal of Cardiology Volume 89, Issue 2, 15 January 2002, Pages 240–242* . Retrieved from http://www.sciencedirect.com/science/article/pii/S0002914901022123

Miyamoto, S., Fujita, M., Tambara, K., Seckiguchi, H., Eiho, S., Hasegawa. K., & Tamaki, S. (2004). Circadian variation of cardiac autonomic nervous activity is well preserved in patients with mild to moderate chronic heart failure: effect of patient position. International Journal of Cardiology Volume 93, Issues 2–3, February 2004, Pages 247–252. Retrieved from http://www.sciencedirect.com/science/article/pii/S0167527303001906

NewsRx. (2005). Cardiovascular Disease; Right-side recumbant position improves oxygenation in valvular heart disease patients . *Obesity, Fitness & Wellness Week*, p 285-285. Retrieved from http://search.proquest.com/docview/207814918?accountid=17242

Puri, G. D., Dutta, A., Chinnan, N. K., Thingnam, S.K., Sharma, S.K, Chari, P. (2005). Arterial oxygenation changes in valvular heart disease patients with cardiomegaly in different recumbent positions. *European Journal Of Anaesthesiology Vol. 22 (11), pp. 834-8*. Retrieved from http://ehis.ebscohost.com/eds/detail?sid=7c94c377-aab6-487b-ad8e-827f40e5d5c2%40sessionmgr114&vid=1&hid=105&bdata=JnNpdGU9ZWRzLWxpdmU%3d#db=cmedm&AN=16225717

Price, S. A., & Wilson, L. M. (2006). *Patofisiologi; konsep klinik proses-proses penyakit. Edisi. 6, vol 1*. Jakarta: EGC.

Sakamoto, S., Tambara, K., Kambara,N., Miyamoto, S., Tsukamoto, T & Fujita, M. (2004). Right Lateral Decubitus Position Reduces QT Dispersion in Patients With Chronic Heart Failure. *Journal of electrocardiology, vol 37 No 3*. Retrieved from http://search.proquest.com/science/docview/216197482/13CC7D78FB764C136E6/1?accountid=17242

Sherwood, L. (2012). *Fisiologi Manusia; dari sel ke sistem Ed. 6.* EGC. Jakarta.

Smeltzer, S. C., Bare, B. G., Hinkle, J. L., & Cheever, K.H. (2010). *Textbook of: medical surgical nursing, 12 ed.* China*:* Lippincott Williams & Wilkins.

Yang, J. L., Chen, G. Y., & Kuo, C. D. (2008). Comparison of effect of 5 recumbent positions on autonomic nervous modulation in patients with coronary artery disease. *Circulation Journal, 72(6), 902-908*. Retrieved from http://www.researchgate.net/publication/5347510_Comparison_of_effect_of_5_recumbent_positions_on_autonomic_nervous_modulation_in_patients_with_coronary_artery_disease/file/d912f50aaee543cee7.pdf

Yeung, D. F., Boom, N. K., Guo, H., Schultz, S., & Tu, J. (2012). Trends in the incidence and outcomes of heart failure in ontario, canada: 1997 to 2007. *Canadian Medical Association.Journal, 184*(14), E765-73. Download from Retrieved from http://search.proquest.com/docview/1314476463?accountid=17242