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ORIGINAL RESEARCH **E-ISSN:**

ANKLE PUMPLING EXERCISE AND LEG ELEVATION IN 30^{O} HAS THE SAME LEVEL OF EFFECTIVENESS TO REDUCING FOOT EDEMA AT CHRONIC RENAL FAILURE PATIENTS IN MOJOKERTO

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ABSTRACT

Background: One manifestation of fluid balance disorders in patients with chronic kidney failure is edema, which if untreated can causes complications in various body systems including the respiratory system, cardiovascular system, and hematology.

Purpose: The purpose of this study was to determine the effectiveness of ankle pumping exercise and leg elevation to edema reduction at patients with chronic renal failure in Mojokerto.

Methods: The research design used was Quasi Experimental Design using the Non-Equivalent Control Group design. The sampling technique used was consecutive sampling; the number of samples taken was 30.

Results: The results stated in the ankle pumping exercise group and the leg elevation group, through the Wilcoxon test both showed a significant decrease in edema with a value of P = 0.001 (α = 0.005). In the comparison between ankle pumping exercise intervention and leg elevation, based on the Mann-Whitney test, P value = 0.248 (P> 0.05) which means there is no significant difference of the ankle pumping and the leg elevation to the decrease the grade of edema in patient's chronic kidney failure.

Discussion: Ankle pumping and leg elevation have the same level of effectiveness in reducing leg edema. So, we can choose the one of these which suitable for patient's condition.

Key words: Edema, ankle pumping exercise, leg elevation in 30^{o}, chronic kidney failure.

INTRODUCTION

The incidence of chronic kidney failure in Indonesia is high. Chronic kidney failure is usually characterized by excess fluid because of sodium retention or lack of albumin. One manifestation of excess fluid volume is edema. Edema often occurs in the area of the legs and eyes (Cherynasari, 2014). In developing countries, it is estimated that approximately 40-60 cases at one million population in one year. Indonesia is estimated to have around 20,000 cases a year (Gupita, 2015). According to the United State Renal Data System in the United States the prevalence of chronic kidney disease increases by 20-25% every year. According to WHO, in Indonesia there will be an increase in

kidney failure sufferers in 1995-2025 by 41.4%.

Data from the Indonesian Nephrology Association (PERNEFRI) there are an estimated 70,000 kidney failure sufferers in Indonesia, it will be increase approximately 10% for every ear (Tandi, Mongan, & Manoppo, 2014). At 2013, 499,800 Indonesians suffered from kidney failure and as many as 1,499,400 residents suffered from kidney stones (Rikesdas, 2013). At 2014, there was 3621 patients with chronic kidney failure (Report Renal Registry, 2014). In Mojokerto, during January until September 2017 recorded 295 patients with chronic kidney failure.

Chronic renal failure (CRF) is a progressive and irreversible disruption of kidney function, where the body is unable to maintain metabolism and electrolyte fluid balance that resulting in uremia (Istanti, 2014). In patients with chronic renal failure, we often encounter patients with edema, edema in chronic renal failure can be caused by the inability to express fluid (nephritic syndrome, associated with hypertension and low urine output) (Aini, 2011).

The occurrence of edema that is not treated properly will affect the quality of life of patients and will cause complications in various body systems, including the respiratory system (respiratory kussmaul, pleural effusion, pulmonary edema), Cardiovascular system (hypertension, heart failure), Neurological system (head pain, sleep difficulties, tremors) and the hematological system (anemia, damage to white blood cells) (Sari, 2016). At skin tissue, edema cause pain and more susceptible to injury when compared to normal tissue due to lack of intake of nutrients, oxygen, and residual substances (Sukmana, 2016).

Ankle pumping exercise is one of the efforts to reduce edema. This exercise aims to improve circulation of the blood (Toya & Sasano, 2016). Pumping exercise is an effective step to reduce edema because it will cause the effect of a muscle pump so that it will push extracellular fluid into the blood vessels and return to the heart (Ruspolina Delila, 2006). Ankle pumping exercise is able to launch back blood circulation from the distal. This can result in decreased distal swelling due to smooth blood circulation (Utami, 2014).

The combination of ankle pumping and foot elevation position to help reduce the hydrostatic pressure of the capillaries so that edema can be reduced (Sukmana, 2016). Leg elevation is a position setting where lower limbs are set higher than the heart so blood back to the heart will increase and blood build up in the lower limbs does not occur (Sukarja & Purnawan, 2011).

Because of the application of ankle pumping and leg elevation can be done by nurses, it does not require energy and a large cost to carry out these interventions, so that the aims of this study was to determine the effectiveness of ankle pumping exercise and leg elevation of 30˚ to reduce edema in patients with chronic kidney failure.

METHODS

Study Design

This study used a Quasi Experimental Design with Non-Equivalent Control Group design.

Setting

This study was conducted in Mojokerto Regency Hospital.

Research Subject

The sampling technique used was consecutive sampling according to the inclusion criteria as follows: Patients with chronic renal failure who have lower limb

edema, patients diagnosed with CRF with stages 4 to 5, are willing to become respondents and have signed informed consent, Age of patients 25-75 years, patients fully aware (Compos mentis). For exclusion criteria: In patients who experience agitation / anxiety, fear. Patients with the addition of albumin serum. The samples obtained were 30 samples with details of 15 respondents in the ankle pumping group and 15 respondents in the foot elevation group of 30º.

Instruments

Researcher collected data using direct monitoring.

Data Analysis

Data was analyzed using Wilcoxon sign rank test, and to determine differences in edema depth between the ankle pumping group and the foot elevation group 30º used Mann U Whitney Test.

Ethical Consideration

Ethical clearance was obtained from the director of Mojokerto Regency Hospital to get the permission. Data collection procedure started with the informed consent to participants that they were briefed about the study and kept their confidentiality.

RESULTS

Characteristics of Respondents by Age, Gender, and CRF Stage

Table 1. Distribution of Frequency of Respondents by Age, Gender, and CRF Stage in Mojokerto Regency Hospital (n = 30).

Characteristics of Respondents		Sample Group		Total	(%)
		Ankle Pumping Group	Leg Elevation in 30°		
Gender	Male	5	5	10	33.3
	Female	10	10	20	66.6
Age	Min	27	25		
	Max	75	65		
	Mean	54.67	53.25		
	SD	13.6	11.46		
CRF Stage	IV	9	6		
	V	6	9		

Characteristic of respondents of this research were consists of 66.6% of respondent were male and 33.3 % were female. The average age of respondents in ankle pumping group was 54.67 years. The youngest age is 27 years and the oldest age is 75 years. In Leg Elevation group, the average age was 53.25. The youngest age is 25 years and the oldest age is 65.

The Depth of Oedemic Before and After Ankle Pumping

Table 2. The Depth of Oedemic Before and After Ankle Pumping in Mojokerto Regency Hospital (n = 30).

	Mean (mm)	SD	Min (mm)	Max (mm)
Before (Pre-Test) Ankle Pumping	3.33	0.816	2	5
After (Post-test) Ankle Pumping	2.20	0.561	1	3

Table 2 shows the mean depth of oedema before ankle pumping is 3.33 mm, with a minimum value of 2 mm and a maximum value of 5 mm. After ankle pumping, the average value of depth of

oedema is 2.20 mm, with a minimum value of 1 mm and a maximum of 3 mm.

The Depth of Oedemic Before and After Leg Elevation

Table 3. The Depth of Oedemic Before and After Leg Elevation in Mojokerto Regency Hospital (n = 30).

Variable	Mean (mm)	SD	Min (mm)	Max (mm)
Before (Pre-Test)	3.20	0.941	2	5
After (Post Test)	2.00	1.000	1	4

Table 3 shows the average of depth of oedema before leg elevation is 3.20 mm, with a minimum value of 2 mm and a maximum value of 5 mm. After leg elevation, the average value of depth of oedema is 2.00 mm, with a minimum value of 1 mm and a maximum of 4 mm.

Examination of The Effect of Ankle Pumping in Reducing Oedema using Wilcoxon Test

Table 4. The Effect of Ankle Pumping in Reducing Oedema at Mojokerto Regency Hospital (n = 30).

	Depth of oedema in Ankle Pumping Group (Post Test) - Depth of oedema in Ankle Pumping Group (Pre-Test)
Z	-3.314
Asymp. Sig.(2-tailed)	0.001

Table 4 shows that *p* value is 0.001 which is smaller than 0.05. It means there was a significant difference in depth of oedema after ankle pumping.

Examination of The Effect of Leg Elevation in Reducing Oedema using Wilcoxon Test

Table 5. The Effect of Leg Elevation in Reducing Oedema at Mojokerto Regency Hospital (n = 30).

	Depth of oedema in Leg Elevation Group (Post Test) - Depth of oedema in Leg Elevation Group (Pre-Test)
Z	-3.307
Asymp. Sig.(2-tailed)	0.001

Table 5 shows that *p* value is 0.001which is smaller than 0.05. It means there was a significant difference in depth of oedema after Leg Elevation.

Examination of The Comparison of Ankle Pumping Exercise and Leg Elevation in Reducing Oedemic using Mann U Whitney Test

Table 6. The Comparison of Ankle Pumping Exercise and Leg Elevation in Reducing Oedemic at Mojokerto Regency Hospital (n = 30).

	Depth Edema in Ankle Pumping and Leg Elevation (post test)
Z	-1,155
Asymp. Sig. (2-tailed)	,248
Exact Sig. [2*(1-tailed Sig.)]	,305[b]

Table 6 that p value is 0.248 which is biggest than 0.05. It means there is no significant difference between Ankle Pumping and Leg Elevation to reduce oedema.

DISCUSSION

Current study Weaning practices Difference in Depth of Edema Before and After Doing Ankle Pumping

Based on table 4 shows that the value of *p* value = 0.001 <α = 0.05, it can be concluded that there are was a significant difference in depth of oedema after ankle pumping.

Ankle pumping exercises utilize the nature of veins that are affected by muscle pumping action so that with strong muscular contractions, muscles will compress veins and edema fluid can be carried by veins to participate in blood circulation so that it can improve the regulation of the central nervous system, oxygen transport capacity, oxidation process and the number of Na K pumps (Utami, 2014).

These results are in line with research that conducted by Ruspolina Delila (2006) at the Usada Mulia Cengakareng Orphanage, West Jakarta on the benefits of adding ankle pumping exercise in elevation position interventions on reducing lower limb oedemic, the results of *p* value = 0.028, which means that there is an influence of ankle pumping exercises against the decrease in the degree of edema.

Based on the analysis of researchers strengthened by related research it can be concluded that the administration of ankle pumping can reduce the degree of edema in patients with chronic renal failure who experience edema. Providing ankle pumping exercises that is by means of the patient positioned as comfortable as possible, then taught how to push the foot forward and backward at the ankles that have edema, so that by giving the exercise occurs muscle contraction that compresses the veins which then increases the regulation of the central nervous system thereby increasing the oxidation process Sodium, Potassium is pushed in the veins and flowed throughout the body's blood vessels so there is a decrease in edema.

Active movement in ankle pumping principally utilizes venous properties, namely the direction of direct flow to the heart which is then influenced by muscle pumping action (muscular contraction) so that with strong muscular movements it will suppress the vein which causes an increase in nervous system regulation so that edema fluid can be brought into the vein. blood circulation. In this process the degree of edema is decreased.

Difference in Edema Depth Before and After the Leg Elevation

Based on table 5 it can be seen that the value of p value = 0.001 <α = 0.05, so it can be concluded that there is a mean difference (mean) degree of edema before and after the leg Elevation 30º.

Leg Elevation can reduce the degree of edema through the use of earth's gravitation force to increase venous and lymphatic flow resulting in a decrease in hydrostatic pressure (Villeco & Otr, 2012). Hydrostatic pressure occurs due to the gravity of blood in the veins. Peripheral veins and arterial pressure are influenced by gravitational forces. Blood vessels higher than the heart will increase and decrease peripheral pressure thereby reducing edema (Sukmana, 2016).

The results of this study are in line with Siregar (2010) at the General Hospital. H. Adam Malik Medan about the influence of 30° Elevated Foot Position on the Bed Against the Reduction of the Foot Edema of Congestive Heart Patients in the CVCU Room, the results obtained p value = 0,000, which means there is an influence of Elevated Foot Position 30º Above the Bed Against Reducing Foot Edema Congestive Heart Patients in the CVCU Room for a decrease in the degree of edema in patients with chronic kidney failure.

The results of this study are in line with the results of related studies where there is an effect of giving a leg elevation to a decrease in edema degree. Leg elevation is done by elevating the position of the edema as high as 30º for 10 minutes. This elevation of the foot's position uses the principle of Earth's gravity thereby increasing the flow and lymphatic flow of the foot which then increases the regulation of the central nervous system so that there is a decrease in hydrostatic pressure which causes a decrease in the degree of edema.

Comparison of Ankle Pumping Exercise and Leg Elevation in Reducing Oedemic

Table 6 shows that P value = 0.248 > α = 0.05 means that there is no meaningful difference between Ankle Pumping and leg Elevation.

In the ankle pumping and leg elevation group in both therapies, there was a mechanism to increase nervous system regulation to reduce edema, the difference lies in the ankle group utilizing venous properties by adding muscle contraction to improve nervous system regulation while leg elevation 30º utilizes gravity to reduce the hydrostatic pressure so that it can reduce edema.

Judging from the change in edema depth, both of these techniques are equally effective in reducing the degree of edema, but to see the effectiveness between the two groups, it is also seen from the magnitude of edema depth reduction. In the 30º foot elevation group there was a greater reduction in edema than in the ankle pumping group, the difference in edema depth decrease in both groups was 0.07mm. according to the researchers' assumptions, there are many factors that influence changes in the depth of edema, including age, kidney failure stage, and the drugs consumed.

According to the researchers' assumptions, the difference in edema decrease in both groups was due to the depth of the edema and the stage of renal failure of each respondent. Chronic renal failure stage has a different GFR value, in each study respondent most of the stage 4 and ESRD i.e. with GFR values range <15 mL / min / 1.73 m2. Decreased GFR function affects abnormal fluid homeostasis causing poor regulation of regulation and excretion functions so that the depth of edema in each respondent is different.

Good regulation is influenced by the GFR value. When the GFR value is low, the regulation power will not optimal. The GFR value described the severity of renal failure. In this research, stage of renal failure of respondents in part stage V and partly stadium IV.

In a previous study Ruspolina (2007) found that leg elevation was more effective in reducing edema compared to ankle pumping. In this study the results of the two interventions showed a significant difference in reducing edema, it has to do with the number of respondents who experienced stage V in the leg elevation group greater than the ankle pumping group. So that the results of this study there were no more significant differences between ankle pumping and leg elevation.

In the ankle pumping and leg elevation group, the same principle is to improve the regulation of the central venous system, one utilizing venous properties and the other to reduce hydrostatic pressure in reducing edema. Relation to regulation can be influenced by age, age affects venous diameter, age increases, the structure of blood vessels changes in the thickness of blood vessel walls followed by narrowing of lumen diameter, changes in endothelial function and stiffness. Small venous diameter increases blood flow resistance faster but requires a long time in reducing

edema if the vein diameter is small. This is confirmed in table 1 the mean age of respondents over 53 years.

CONCLUSION

Ankle pumping and leg elevation have the same level of effectiveness in reducing leg edema.

SUGGESTION

Ankle pumping or leg elevation can apply to reducing leg edema. As a nursing, we can recommendation these therapy to Patients with Chronic Renal Failure who suffer from leg edema. They can choose one of these which suitable with their conditions.

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