

Original Research Article

Effect of warm footbath with vibration on arteriovenous fistula puncture-related pain in hemodialysis patients

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ABSTRACT

Background: Pain and stress of hemodialysis are experienced by more than 50% of patients who are suffering from renal disease; hence decreasing a part of these adverse effects can be effective on individual's long term coping with hemodialysis. The current study was done to determine the effect of warm footbath with vibration on arteriovenous fistula puncture-related pain in hemodialysis patients.

Methods: This clinical trial was conducted on 31 hemodialysis patients in 2014. The patients were selected by simple random sampling method and placed in one group. First, the pain intensity of all patients was measured in the six frequent hemodialysis sessions without any intervention (control method). After two weeks, the intervention of warm footbath with vibration was done on all patients and the pain intensity was measured for six frequent hemodialysis sessions (intervention method). The patients were received 40 ± 2 °C footbath with vibration by foot massage spa machine for ten minutes; then, fistula needles were placed and the pain intensity was assessed by using a numerical rating scale. Data were analyzed by ANOVA and T test.

Results: The study group had contained 20 males (64.5%), 11 females (35.5%), with an average age of 44.16 ± 14.85 and a range of 18 to 65 years old, which shows that the pain intensity of the warm footbath with vibration method was lower than the control method ($P < 0.05$).

Conclusions: Warm footbath with vibration can be used as an effective palliative method to reduce pain of hemodialysis patients.

Keywords: Fistula needle, Footbath, Pain, Vibration

INTRODUCTION

The end-stage renal disease is an irreversible degeneration of kidneys' function which can affect all age groups. Annually, more than 60,000 people would be died by kidney diseases all over the world.^{1,2} Statistics show that numbers of dialysis patients would be doubled per 10 years in U.S.³ Although Hemodialysis is known as the most common therapeutic line for those patients who are suffering from kidney disease in recent years, it is a

challenging process which causes socio-mental disorders.⁴ Experiencing some sort of pain is one of inconveniences reported by more than 50% of these patients.⁵

For a hemodialysis patient there is nothing more stressful than being exposed by big needles in the arteriovenous fistula site frequently; hence, most of these patients speak about the puncturing process as their most common difficulties.^{6,7} As sometimes more than one try to place

these needles correctly while accessing the suitable blood circulation is needed, doing hemodialysis three times a week makes the patient expose to the skin bore and pain approximately 300 times per year.^{6,8} Therefore, decreasing part of these side-effects is so important to increase patients' coping with hemodialysis.⁹

Thermotherapy is one of the simple, safe, cheap and effective non-pharmacological interventions which can decrease the pain based on the gate-control theory.^{10,11} Warm footbath is one of the non-invasive nursing interventions which is frequently done by various methods such as with or without bubble, vibration, aromatherapy and massage.¹²⁻¹⁵ This kind of care not only helps to maintain the foot skin function and integrity, but also would be helpful for whole human body; it can produce positive physiological effects, relaxation, sleep improvement and tension reduction as well.^{12,14,16} Warm footbath induces relaxation, increases easiness and releases the pain in those patients who are suffering from incurable cancers.¹⁷ Besides, researches show that warm footbath is as an effective intervention in decreasing backache and the pain of hand Replantation surgery.^{18,19}

Vibration-therapy is one of the safe and effective non-pharmacological methods which can soothe the acute and chronic pain based on the gate-control theory. This method can be useful for distracting and relaxing the patient, establishing a communication between the patient and nurse as well as reducing the consumption of analgesics.^{20,21} According to some studies, using the vibrating stimulus can relieve chronic backaches and primary dysmenorrhea.²² Moreover, using local heat with vibration would be increasingly useful in pain remission, life quality and the patient's motion in those who are suffering from knee osteoarthritis.²³ According to a study, although warm footbath has useful effect in creating relaxation on young women, it is more effective along with vibration and air bubble. As a result, researchers recommend using warm footbath with vibration and air bubble as one of the nursing actions.¹⁴

Based on the aforementioned points, the present study was accomplished with the aim of determining the effect of warm footbath with vibration on arteriovenous fistula puncture-related pain in hemodialysis patients.

METHODS

Having confirmed by ethics committee in the researches department of Qazvin University of Medical Sciences and being registered in Iranian Registry of Clinical Trials center entitled NO. IRCT2013091114634N1, this clinical trial was done on 31 hemodialysis patients in the hemodialysis center of public medical treatment-educational hospitals of Qazvin city in 2014. Sample size was determined based on data gathered from related researches. All 224 patient of hemodialysis center were assessed for eligibility by considering inclusion criteria and 35 patients were selected to start the study $\alpha=0.05$,

$\beta=0.15$. No patients withdrawn from the study and the reasons for the incomplete study were the death and kidney transplantation. Finally, 31 patients completed the study (Figure 1).

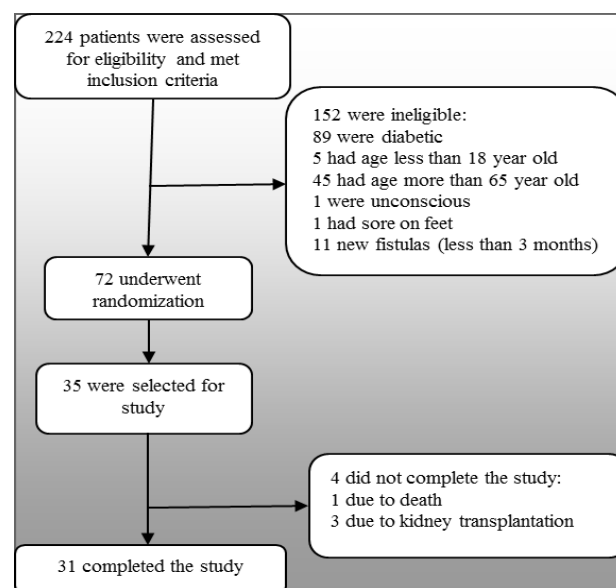


Figure 1: Patients' flow across the study.

Inclusion criteria

The inclusion criteria were having arteriovenous fistula for more than 3 months, lack of obvious peripheral vascular disease, lack of sore up to ankle on both feet, lack of neural and sensory disorders, no history of Diabetes, being conscious and oriented×3, having ability of verbal and visual communication, being in the 18-65 age level.

Exclusion criteria

The exclusion criteria were frequent use of any analgesics or any soothing method which is effective on fistula puncture-related pain, stopping the hemodialysis, long-term traveling, not willing to continue the research, kidney transplantation and death.

Additionally, if a patient mentioned any other kind of pain in the process of intervention time or took any drug or effective method for soothing pain, the patient was excluded in that study session and then was back to the study in the next hemodialysis session.

If this process was repeated in several sessions, the patient was completely excluded from the research. The intensity of pain was only measured in the first time in which the patient's skin was bore by a nurse for the placement of arteriovenous needles. In case that the needle was not in the right place and the second try by the nurse needed (re-boring the skin), the patient was excluded in that study session and then was back to the study in the next hemodialysis session.

Study protocol

Pain ruler was graded from 0 to 10, zero was no pain and ten signified the most severe degree of pain. The validity and reliability of this standard tool has been proven in several studies.²⁴⁻²⁶ Having informed totally about the research conditions to the qualified patients and completing the ethical inform consent was written by them, using the pain ruler was trained. After that, the pain intensity of all patients was measured in the six frequent hemodialysis sessions without any intervention (control method). Passing two weeks, the intervention of warm footbath with vibration was done on all patients and the pain intensity was measured after the intervention for six frequent hemodialysis sessions (intervention method). Warm footbath was done by a foot massage spa machine for ten minutes. The device was capable to be set and fix the water temperature in 40±2 centigrade degree with a steady form of vibration. Each patient immersed the feet into the warm-water in laid down position while their knees were bended. The feet were immersed up to ankle inside the 40±2 centigrade degree water for 10 minutes. After that, fistula needles were placed and the pain intensity was assessed by using the pain ruler. After finishing the intervention, the patient’s feet were dried by using a disposable towel. The foot massage spa machine was washed and disinfected after each intervention. The temperature of water and environment were measured by a standard mercuric thermometer.

Data collection

Data were gathered by a questionnaire of demographic information and a pain ruler. The following data were collected for all patients: age, gender, duration of arteriovenous fistula, history of hemodialysis, frequency of hemodialysis sessions, arteriovenous fistula’s site and past medical history as well as pain intensity. In order to control the confounding factors, all process of fistula

needle placement were done in hemodialysis ward by 4 nurses who had at least 6 months work-experience. The size, shape and company-maker of all needles were same. The method of fistula needle placement for all samples was in 20-30 degree of angle and in the ladder form. Moreover, accomplishing the intervention and recording the results were all done by one person.

Statistical analysis

Our data had normal distribution; it has been analyzed using software SPSS version 20 by ANOVA and T-test. P value less than 0.05 were considered as a significant difference in this study.

RESULTS

The study group had contained 20 males (64.5%), 11 females (35.5%), with an average age of 44.16±14.85 and a range of 18 to 65 years old.

Table 1: Duration and site of arteriovenous fistula and history of hemodialysis.

Duration of fistula	NO.	%
3-12 months	5	16.1
1-3 years	20	64.5
More than 3 years	6	19.4
Total	31	100
History of hemodialysis		
3-12 months	3	9.7
1-3 years	19	61.3
More than 3 years	9	29
Total	31	100
Arteriovenous fistula site		
Left antecubital	19	61.3
Right antecubital	3	9.7
Left wrist	9	29
Total	31	100

Table 2: Arteriovenous fistula puncture-related pain intensity with gender difference.

Fistula needles	Method	Average pain intensity	Analysis	
Arterial	Intervention	2.34±0.72	t= 9.551; df= 30 P= 0.00	
Arterial	Control	4.0±1.22		
Venous	Intervention	2.25±0.75	t= 10.443; df= 30 P= 0.00	
Venous	Control	3.93±1.46		
Gender	Fistula needles	Method	Average pain intensity	Analysis
Male	Arterial	Intervention	2.21±0.71	df= 29 P= 0.189
female			2.57±0.70	
Male	Arterial	Control	3.80±1.22	df= 29 P= 0.215
Female			4.37±1.19	
Male	Venous	Intervention	2.05±0.65	df= 29 P= 0.036
female			2.63±0.80	
Male	Venous	Control	3.60±1.31	df= 29 P= 0.085
female			4.54±1.58	

In most of cases the duration of arteriovenous fistula and history of hemodialysis were 1 to 3 years, and the arteriovenous fistulas were placed in the left antecubital area (Table 1). The patients' past medical histories were hypertension in 16 patients (51.6%), coronary disease in 2 patients (6.5%) and stroke in 1 patient (3.2%). Twelve patients (38.7%) were without past medical history. The frequency of hemodialysis sessions were three times a week for 29 patients (93.5%) and four times a week or more for 2 patients (6.5%).

There was a statistically significant difference in arteriovenous fistula puncture-related pain intensity between two methods. The pain intensity in warm footbath with vibration method was significantly less than control method. In both methods females reported more pain intensity than males (Table 2). No significant relationship was seen among none of demographic characteristics including age, gender, duration of arteriovenous fistula, history of hemodialysis, frequency of hemodialysis sessions, arteriovenous fistula's site and past medical history with the pain intensity of arteriovenous fistula puncture ($P>0.05$).

DISCUSSION

This study showed that using warm footbath with vibration decreases arteriovenous fistula puncture-related pain in hemodialysis patients. According to the study that was done by Yoon et al about the effects of warm footbath on patients with hands Replantation surgery in south-Korea, the average of pain severity in the first day after surgery in control group was 3.4 ± 2.44 and in intervention group was 2.4 ± 1.78 . This average also was 1.3 ± 1.60 and 1.1 ± 2.00 in the control group, 2.0 ± 1.89 and 1.3 ± 2.09 in the intervention group in day sixth and twelfth after surgery.

Therefore, warm footbath was suggested as an effective intervention for reducing the pain of this kind of patients.¹⁹ Nanitsos et al studied about the effect of vibration on pain during local anesthesia injections in Australia. In this study the level of pain intensity in intervention group was significantly less than control group and the results showed that the vibrational stimulus can be used to reduce the injection related pain.²⁷ The findings of two recent studies were in accordance with present research.

According to Saekia et al, using warm footbath with vibration and air bubble by a mechanical stimulus machine was effective on inducing relaxation. Besides, using warm footbath with vibration and bubble in order to improve the function of autonomic and immune system was recommended.¹⁴ It seems that relaxation can also be effective on reducing arteriovenous fistula puncture-related pain in hemodialysis patients. Present results showed that there was no significant relationship among none of demographic characteristics in two studied methods with the arteriovenous fistula puncture-related

pain and it was in accordance with research of Sabitha et al and Hassan M et al.^{8,9} In both methods females reported more pain intensity than males. The study of Sabitha et al showed that females reported more arteriovenous fistula puncture-related pain than males which was similar to our findings.⁹

CONCLUSION

Finally, present findings show that using warm footbath with vibration effectively reduces the fistula needles-related pain in hemodialysis patients. These results can be used as an independent nursing intervention and an effective soothing non-pharmacological method in order to manage the pain of these kinds of patients.

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Conflict of interest: None declared

Ethical approval: The study was approved by the ethics committee of the researches department of Qazvin University of Medical Sciences and being registered in Iranian Registry of Clinical Trials center entitled No. IRCT2013091114634N1 in 2014

REFERENCES

- Black JM, Hawks JH. Medical-surgical nursing clinical management for positive outcomes 8th ed. Saunders Elsevier. Vol 1. 2009.
- Phipps WJ, Sands Jk, Mark JF. Nursing of urinary tract disease and dialysis. Translated by Shorofi A. Chehr Publishing. 2003.
- Collins AJ, Foley RN, Gilbertson DT, Chen SC. The State of chronic kidney disease, ESRD, and morbidity and mortality in the first year of dialysis. *Clin J Am Soc Nephrol.* 2009;4(1):5-11.
- Navidian A, Arbabi Sarjou A, Kikhai A. Frequency of mental disturbances in hemodialysis patients referred to hemodialysis ward of Khatamol Anbia Hospital in Zahedan. *J Med Gilan Univ Sci.* 2006;58(15):61-7.
- Davison SN. Pain in hemodialysis patients: prevalence, cause, severity, and management. *Am J Kidney Dis.* 2003;42(6):1239-47.
- Figueiredo AE, Viegas A, Monteiro M, Poli-de-Figueiredo CE. Research into pain perception with arteriovenous fistula (AVF) cannulation. *J Ren Care.* 2008;34(4):169-72.
- Ball LK. Improving Arteriovenous Fistula Cannulation Skills. *NN J.* 2005;32(6):1-8.
- Mahfouz Hassan A, Darwish MM, El-Samman GA, Ibrahim Fadel F. The impact of cryotherapy on pain intensity at puncture sites of arteriovenous fistula among children undergoing hemodialysis. *J Am Sci.* 2012;8(12):1490-500.
- Sabitha PB, Khakha DC, Mahajan S, Gupta S, Agarwal M, Yadav SL. Effect of cryotherapy on arteriovenous fistula puncture-related pain in hemodialysispatients. *Indian J Nephrol.* 2008;18(4):155-8.

10. Kozier BJ, Erb G, Berman AJ, Snyder S, Buck M, Yiu L, et al. *Fundamentals of Nursing Concepts, process and practice 3rd Canadian ed.* Pearson Canada Inc. 2014.
11. Taylor C, Lillis C, LeMone P, Lynn P. *Fundamentals of nursing: The art and science of nursing care 6th ed.* Lippincott Williams & Wilkins. 2008.
12. Yamamoto K, Aso Y, Nagata S, Kasugai K, Maeda S. Autonomic, neuro-immunological and psychological responses to wrapped warm footbaths - A pilot study. *Complement Ther Clin Pract.* 2008;14(3):195-203.
13. Ohnari H. Effect of microbubble bathing of lower extremities on peripheral circulation. *Bull Yamaguchi med school.* 2011;57(3-4):25-32.
14. Saekia Y, Nagaia N, Hishinumab M. Effects of footbathing on autonomic nerve and immune function. *Complement Ther Clin Pract.* 2007;13(3):158-65.
15. Min ZHU. Effects of Warm Water Footbath Combined with Massage on Patients with Essential Hypertension. *Nursing J of Chinese People's Liberation Army.* 2009;24.
16. Inoue S, Kaneko F, Okamura H. Assessment of the efficacy of footbaths as a means of improving the mental health of nurses: a preliminary report. *Graduate school of health Sci Hiroshima Univ.* 2011;9(2):27-30.
17. Yamamoto K, Nagata S. Physiological and Psychological Evaluation of the Wrapped Warm Footbath as a Complementary Nursing Therapy to Induce Relaxation in Hospitalized Patients with Incurable Cancer: A Pilot Study. *Cancer Nursing TM.* 2011;34(3):185-92.
18. Masako M. Evaluation Research on the Use of the Foot Bath for Pregnant Women Experiencing Low Back Pain. *J Japan Academy of Nurs Sci.* 1999;19(1):31-41.
19. Soon young Y, Myoungjin K. The Effect of Foot Bath Therapy on Post-operation Pain, Stress, HRV in Hand Replantation Patients. *Korean J of Occupational Health Nurs.* 2011;20(2):105-12.
20. Craven RF, Hirnle KJ. *Fundamentals of nursing human health and function 6th ed.* Lippincott Williams & Wilkins. 2009.
21. Lundeberg T. Long-Term Results of Vibratory Stimulation as a Pain Relieving Measure for Chronic Pain. *Pain.* 1984;20(1):13-23.
22. Tappeh RGS, Sanagoo A, Hosseini M, Ghalleh Ghafi A, Mokarram R, Jouybari LM. Effect of heat and vibration on primary dysmenorrhea. *J of Gorgan Univ of Med Sci.* 2011;13(3):35-41.
23. Kitay GS, Koren MJ, Helfet DL, Parides MK, Markenson JA. Efficacy of combined local mechanical vibrations, continuous passive motion and thermotherapy in the management of osteoarthritis of the knee. *Osteoarthritis and Cartilage.* 2009;17(10):1269-74.
24. Kordi M, Firoozi M, Esmaili H. Effect of LI4 Acupressure on Labor Pain in the First Stage of Labor in Nulliparous Women. *J Nursing and Midwifery, Tehran Univ of Med Sci (hayat).* 2010;16(3,4):95-101.
25. Williamson A, Hoggart B. Pain: a review of three commonly used pain rating scales. *J Clin Nurs.* 2005;14(7):798-804.
26. Jensen MP. The Validity and Reliability of Pain Measures in Adults with Cancer. *J Pain.* 2003;4(1):2-21.
27. Nanitsos E, Vartuli R, Forte A, Dennison P, Peck C. The effect of vibration on pain during local anaesthesia injections. *Aust Dent J.* 2009;54:94-100.

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