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Comparing the effects of Valsalva maneuver and ice massage at Hoku point methods on pain intensity within the needle insertion to the arteriovenous fistula (AVF) for patients undergoing hemodialysis in the selected hospitals in Isfahan in 2015

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ABSTRACT

Pain is an unpleasant feeling and it is called as the fifth vital sign. Fistula cannulation in hemodialysis patients is a very stressful and painful process. Nurses can help to relieve pain with the use of non-pharmacological pain management therapies, independently. This study was conducted aimed to compare and determine the effects of Valsalva maneuver and ice massage at Hoku point on pain intensity during cannulation of arteriovenous fistula in patients undergoing hemodialysis. This study was conducted on 70 hemodialysis patients who were selected by convenience sampling in two Amin Medical Center and Hazrat-e Zahra-e Marziye Hospital in Isfahan and were placed in two groups of Valsalva maneuver and ice massage. Data collecting was performed using an interview questionnaire developed by the researcher, Abbey pain scale and numerical pain rating. Data analysis was done using the descriptive and analytic tests in SPSS software version 20. Mann-Whitney results showed that there was no significant difference in objective pain rate between two groups after intervention (P=0.73). Also this test showed that after intervention, objective pain rate in Valsalva maneuver group is significantly less than ice massage group (p=0.04). Valsalva maneuver method compared to ice massage method reduces the objective pain due to cannulation of arteriovenous fistula in patients undergoing hemodialysis, more efficiently.

Keywords: Hoku point, Valsalva maneuver, ice massage, hemodialysis..

INTRODUCTION

Pain is an unpleasant feeling and an emotional experience which is associated with the actual or potential tissue damage and physiological and psychological response and the most common cause of visiting the health care centers [1]. In this regard, the American Pain Society has made the phrase "pain: the fifth vital sign" common, to emphasize on the importance of pain and increase the awareness of health care professionals about its control [2].

Millions of people around the world suffer from pain without adequate treatment every year [3]. One of the pain reasons is diagnostic-therapeutic procedures [1]. Patients often know the pain resulted from the procedure worse than the status which needs the procedure. If pain is not prevented and treated, patients experience several harmful effects and its levels increases by consecutive procedures [4].

One of the most common invasive procedures in hospitals is inserting the intravenous catheters [5]. This process is painful and stressful [6]. Fear of injection by needles affects on at least 10% of the population and in severe cases

may leads to avoidance of medical care [7]. Hemodialysis patients frequently exposed to the pain resulted from inserting big needles to their fistula for about 300 times and must continue it in their lifetime or until a successful kidney transplant [8].

Nayak-Rao (2010) indicates that pain is associated with decrease in quality of life indicators including increased disease, depression and decreased life satisfaction [9]. Asgari et al (2012) quote Taqinejad and Tahmasby and say: the important point to take care of these patients is that they need to be supported for these complications [10].

KhaliliShomia (2011) quote Kim et al and believes that the standard method for skin anesthesia in intravenous injections is included injection into the skin surface and subcutaneous layers, by Lidocaine and Prilocaine using a thin needle and with respect to the injection of anesthetic material is painful, a risk of injuries caused by needle will cause discomfort, fear and anxiety, so using it in venipuncture does not make sense [11]. Also, lidocaine makes skin tighter and putting the needles harder. Injection of local anesthetics usually does not use because of vasoconstriction, pain and infection which often occur [12].

Non-pharmacological interventions like cutaneous stimulation have been defined in order to reduce the symptoms such as pain, spasms or muscle inflammation [3]. Cutaneous stimulation are classified as cold therapy, heat therapy, physical therapy, treatment with rest and limited movement, acupuncture, water therapy, TENS, massage and touch therapy [13]. Hoku point is one of the acupressure points related to Meridian of large intestine. This point is located on the back of the hand, between the thumb and index finger and is used to relive the pain [3].

Cold therapy as one of the cutaneous stimulation methods is a simple and cheap method that has an important place among non-pharmaceutical treatments for pain control [13]. Cold therapy is a simple and effective intervention before the venous cannulation to relieve pain of venipuncture (14]. Also, ice massage on Hoku point decreases the pain due to the needle insertion to arterial-venous fistula in hemodialysis patients [3, 15].

Valsalva maneuver is one of the non-pharmacological methods that can be used to reduce pain[6]. Valsalva maneuver have no need to any equipment, it is easy to learn for patients and reduces the pain intensity due to the peripheral venous cannulation as well as it increases the success of venous cannulation[7]. Valsalva maneuver reduces the pain due to the skin puncture in spinal injection [16]. This maneuver causes distraction, therefore this method is used to relieve the pain of venipuncture in children [17].

With respect to the patients' rights and needs of Maslow's pyramid, relieving pain is one of the basic human rights. Therefore, pain assessment and management are considered as the nursing priority and one of the important aspects of clinical nursing [18]. So, the need to find the new agents with maximum effect and minimal side effects which are accepted by all patients, is felt.

Given that the majority of studies have emphasized to control pain during insertion of vascular needles in patients undergoing hemodialysis and pain relief should be considered as a part of their treatments [19]. Also, various studies have shown the usefulness of ice massage at Hoku point in relief the pain due to the arteriovenous fistula cannulation in hemodialysis patients and Valsalva maneuver is introduced as a pain reducing method in venous cannulation and due to the effect of this maneuver in pain reduction resulted from arteriovenous fistula cannulation in patients undergoing hemodialysis is not studied yet, therefore this research was conducted aimed to compare the effects of two methods of ice massage at Hoku point and Valsalva maneuver on the pain intensity within fistula cannulation in the patients undergoing hemodialysis. The research findings can lead to identify the effect and compare two different treatment methods to relieve or reduce the pain due to inserting the vascular needles to arteriovenous fistula cannulation in hemodialysis patients and if they are effective, this research findings can be applied by clinical nurses in care and relief the pain of arteriovenous fistula cannulation in hemodialysis sections as well as teaching these methods to the patients.

MATERIALS AND METHODS

This research is a quasi-experimental study from the clinical trial. The target population of this study included all patients over 18 years, undergoing hemodialysis in Amin Medical Center and Hazrat-e Zahra-e Marziye Hospital in Isfahan. Sampling method in this study was simple (convenience) sampling which 70 samples were selected by visiting the researchers in research environment and then divided accidentally into two groups of ice massage and Valsalva maneuver.

In order to achieve to the goal of this research, three tools are used to collect data which are included:

Tool 1: interview questionnaire including personal information, medical information and the information related to arteriovenous fistula. This research-made questionnaire is prepared to evaluate the socio-demographic and medical information of patients and includes three parts:

Part one: the personal information including the information related to age, sex, occupation, education level and marital status.

Part two: medical information including the information about ESRD cause, term of dialysis, the presence of chronic diseases, vital signs (pulse and blood pressure), results of renal function test (BUN and Cr), dry weight of patient, and transplant history.

Part three: related information to arteriovenous fistula including the information about the time length of fistula and the problems related to arteriovenous fistula including inflammation, warmth, redness, pain, hematomas and hemorrhage and others.

Tool 2: Abbey pain scale: this scale was prepared by Abbey et al and is used to evaluate the objective behavior of pain [3] includes 6 items of vocalization, facial expressions, changes in body language, behavioral change, physiological and physical changes. Pain is classified as multiple parts (4-points) in this scale [20]. Each option is four-points Likert boxes that is classified the objective behavior of pain as several sub titles. Vocalization option includes groan, shouting and crying, facial expression option includes nervousness, scowled and frightened face, and change in body language option includes anxiety, moving, taking a part of the body and pulling. Behavioral change option includes confusion, refuse to eat and change in usual patterns. Physiological change option includes changes in temperature, pulse and blood pressure within the normal range, sweat, warmth or paleness. Physical changes includes skin puncture, pressure areas, arthritis, contractor and the previous injuries. The scores of each option has been arranged from 0 to 3 which 0, 1, 2 and 3 represent no pain, mild pain, moderate pain and severe pain, respectively. All scores are added as a higher score represents the total score of pain intensity. Total score: 0-2 represents no pain, 3-7 represents low or mild pain, 8-13 indicates moderate pain, 14 and higher indicates severe pain [3].

Tool 3: pain numerical rating scale 0-10: this scale is provided by Mc Caffery and Beebe to evaluate mental pain. This scale consists of a 10 cm line which is numbered from 0 to 10 (3). Where 0 represents no pain and 10 shows the most severe pain. Ranking scores as 1-3, 4-6 and 7-10 represent mild, moderate and severe pains, respectively [6].
Content validity method was used to determine the scientific validity of interview questionnaire, in this study. So that the above questionnaire was examined by 5 members of the faculty of Islamic Azad University Isfahan, (Khorasgan) Branch in terms of content and appearance validities and was approved after revisions. The interview questionnaire has the essential reliability due to demographic recording. Medical information was recorded based on patient records and the information related to arteriovenous fistula based on observation and has the required reliability.

Regarding the validity of Abbey pain questionnaire, it should be stated that the mentioned questionnaire was examined and approved by 5 faculty members of Islamic Azad University Isfahan, (Khorasgan) Branch. The internal consistency of the questionnaire is obtained 0.774 using alpha Cronbach method and test-retest method was used to calculate the reliability of the tool that Pearson correlation coefficient is calculated as 0.843 and it was determined 0.87 for this tool in Fareed et al study (2014).

The scientific validity and reliability of numerical rating scale of the pain were considered as 0-10 in several studies. Asgari et al (2013) indicate that the results of Hoggart and Williamson study regarding this tool shows that this tool has appropriate validity and reliability and actually can be used in treatment. In Fareed et al study (2014), the Pearson correlation coefficient for pain numerical rating scale of 0-10 is determined 0.94.

In this study, the following inclusion criteria were considered: 1- patients in this study are treated with hemodialysis. 2- Dialysis is performed through AVF. 3-patients desired to participate in the study. 4-they should be older than 18 years. 5-they should be fully conscious and have the ability to respond the questions. 6- Verbal and visual communication can be achieved. 7- without feeling severe pain in the area of the body before inserting needles into the fistula. 8- No history of drug use. 9- Analgesics or sedatives were not used within 6 hours before hemodialysis [10]. 10- AVF cannulation is possible over a time. 11- Without the history of diseases such as Alzheimer, dementia, peripheral vascular disease, neuropathy disorders due to diabetes. 12-without the history of heart diseases, glaucoma, increased pressure in the brain and recent eyes surgery [7]. 13- without inflammation and damage, redness, pain and bruising in the skin where needle is inserted into the fistula. 14-not to mention the sensitivity of ice

massage. 15-be able to perform the Valsalva maneuver and keep the column of mercury up to 20 mmHg for 20 seconds [6].

Exclusion criteria in this study were determined by researchers: 1- Unwillingness of patients to continue to participate in the study, 2- Death or not to continue treatment in the second session, 3- Lack of proper venipuncture with an attempt at the second session of treatment, 4-Taking a tranquilizer before the start of the second session of hemodialysis, 5-Inability to correctly perform the Valsalva maneuver

In the procedure, after obtaining the necessary permits from the Islamic Azad University Isfahan, (Khorasgan) Branch and Isfahan University of Medical Sciences and obtaining a code of ethics to number 293335, coordination with the authorities was done and after selecting the samples and getting the informed consent from them, patients were evaluated at two consecutive sessions of dialysis. In the first session without intervention, 10 minutes before AVF cannulation and 5 minutes after it, patients' pulse and blood pressure were checked and recorded by the researcher. Before fistula cannulation, evaluation of subjective pain caused by inserting needle to the fistula based on pain numerical rating scale was taught by the researcher to patients. Then, arterial cannulation with the needle gage 16 was performed by nurse at least from a distance of 5 cm of fistula at an angle of 30 to 45 degrees while the bevel edge of needle was high [10].In the second session or intervention in ice massage group and before intervention, the procedure was explained to each patient and after checking of the pulse and blood pressure, 10 minutes before cannulation and within it, the distance between the thumb and index finger (Hoku point) of the opposite patient's hand of the hand with fistula was massaged by the researcher circularly with an ice ball in 1.5-2 cm diameter in a plastic gloves which was placed within a single-layer cotton cloth. So that, the maximum time of massage in each turn was one minute and then massage was stopped for 10 seconds [21]. This intervention lasted for the whole 12 minutes. Immediately after arterial cannulation, patients were asked to indicate their subjective pain score based on the related scale. The objective pain score was recorded by researcher with observing the situation and behavior of the patient during cannulation. 5 minutes after cannulation, pulse and blood pressure were checked and recorded, again.

In Valsalva maneuver group, 10 minutes prior to cannulation, patients' blood pressure and pulse were controlled and recorded and the method were taught by researcher to each patient. Then, electrodes of heart monitoring device were attached to the patient in lying position and heart rhythm and pulse rate of the patient were controlled during exercise. Then, the patients were requested to blow into the hole of disposable syringe which was mounted in one side of plastic tube of sphygmomanometer and its other side was connected to manometer of sphygmomanometer and bring the mercury column up to 20 mmHg and keep it there for 20 seconds. The tube had a small hole that made maneuver with closed epiglottis difficult and thus opening epiglottis and doing correct at time of maneuver was provided [22]. Arterial cannulation was performed by the nurse 20 seconds later [7]. The syringe was used for personal hygiene. Abbey pain questionnaire was filled by the researcher during cannulation and immediately after fixing needle, researcher asked patient to express the score of subjective pain due to the needle insertion. 5 minutes after cannulation, patient's pulse and blood pressure were controlled and recorded by the researcher, again.

Data analysis: all data were collected and entered into SPSS version 20 and the analysis results were determined using independent t-test, paired t-test, Mann Whitney, Wilcoxon test, Chi-square test and Fisher's exact test. P-value was considered significant at lower than 0.05 in all analysis.

The following items were considered as the study limitations: 1-individual differences in pain threshold in different people that causes patients understand different degrees of pain. 2-Psychological status of patients during dialysis sessions which can affects on patient's perception of pain.

Findings: according to the research results, the medical and demographic statistics show that the age average of the studied units is 58.8±11.2 years old. The most percent of the studied units' frequency by sex, men: (58.6%), occupation (housewives and unemployed): (52.9%), primary education: (31.4%), married: (92.2%), the cause of chronic renal failure (diabetes): (35.7%), term of dialysis (1-3 years): (48.6%), duration of fistula (1-3 years): (44.3%), no aneurysm fistula: (55.2%), no history of transplantation: (88.6%), no chronic diseases (hepatitis C): (97.2%). Mean of dry weight: 66.4±11.06 kg, BUN: 118.9±35.1 mg/dl and creatinine: 8.2±2.04 mg/dl.

Table 1- score averages of objective pain and subjective pain before and after intervention

Group	Variable	Before intervention		After intervention		Paired t-test	
		mean	sd	mean	sd	T	P
Valsalva	Objective pain score	2.9	0.7	2.4	0.7	4.97	P<0.001
	Subjective pain score	5	1.6	4.1	1.7	6.91	P<0.001
Ice massage	Objective pain score	3.2	1.1	2.8	1.1	4.62	P<0.001
	Subjective pain score	4.9	1.5	4.2	1.3	5.36	P<0.001

Table 1 shows that the averages of objective and subjective pain scores before intervention in Valsalva maneuver group and ice massage group are 2.9±0.7 and 5±1.6 and 3.2±1.1 and 4.9±1.5 respectively and also after intervention are 2.4±0.7 and 4.1±1.7 in Valsalva maneuver group and 2.8±1.1 and 4.2±1.3 in ice massage group. Paired t-test 1 showed that the averages of objective and subjective pain scores after intervention is decreased significantly (P<0.001) compared to before intervention, in both Valsalva maneuver and ice massage groups.

Table 2- objective pain intensity before and after intervention in the studied units

time	Objective pain rate	Valsalva maneuver group		Ice massage group		Mann-Whitney test	
		No.	%	No.	%	Z	P
Before intervention	Without pain	11	31.4	9	25.7	0.52	0.59
	Mild pain	24	68.6	26	74.3		
After intervention	Without pain	25	71.4	18	51.4	2.07	0.04
	Mild pain	10	28.6	17	48.6		
Wilcoxon test	Z	3.74		3			
	P	P<0.001		0.003			

Results of table 2 shows that before intervention, the most frequency percentages (68.6%) of Valsalva maneuver group and (74.3%) of ice massage group had mild pain from the studied units. After intervention, the most frequency percentages (71.4%) of Valsalva maneuver group and (51.4%) of ice massage group were without pain. Mann-Whitney test showed that before intervention, the objective pain rate between two groups had no significant difference (P=0.59) but after intervention, the pain rate in Valsalva maneuver group was significantly lower than ice massage group (p=0.04). Wilcoxon test showed that objective pain rate is decreased in both Valsalva maneuver group (P<0.001) and ice massage group (P=0.003).

Table 3- subjective pain intensity before and after intervention in the research units

time	Subjective pain rate	Valsalva maneuver group		Ice massage group		Mann-Whitney test
		No.	%	No.	%	P
Before intervention	Mild pain	5	14.3	4	11.4	0.82
	Moderate pain	25	71.4	26	74.3	
	Severe pain	5	14.3	5	14.3	
After intervention	Mild pain	15	42.9	12	34.3	0.73
	Moderate pain	16	45.7	21	60	
	Severe pain	4	11.4	2	5.7	
Wilcoxon test	P	0.001		0.001		

Results of table 3 showed that before intervention, the most percentages of frequency of subjective pain due to the needle insertion in Valsalva maneuver group (71.4%) and in ice massage group (74.3%) have been related to the patients with moderate pain. After intervention and in terms of the mental pain due to the needle insertion, the most percentage of frequency in Valsalva maneuver group (45.7%) and in ice massage group (60%) have been related to the patients with moderate pain. Mann-Whitney test showed that the pain intensity due to the needle insertion had no significant difference between two groups, before intervention (P=0.82) and also after intervention (P=0.73). Wilcoxon test showed that the subjective pain intensity due to the needle insertion has decreased significantly in both Valsalva maneuver group (p=0.001) and ice massage group (P=0.001).

DISCUSSION

The demographic (age and sex) and medical statistics (diabetes) in patients is not a measure of hemodialysis in all patients, as these patients were selected based on having the AVF. Yevzlin et al (2014) indicate that the success of AVF in patients over 65 years, females and diabetics is lesser [2].

According to the results of this study in order to compare the severity of pain within the needle insertion to AVF in ice massage group before and after intervention, based on table (1) the average scores related to the objective and subjective pains due to the needle insertion have been decreased (P<0.001). The results of Fareed et al study (2014) also showed that 55.8% of the studied samples, had the moderate score of objective pain before using the cutaneous stimulation (ice massage on the point) while after using that, 67% and 65.4% of them had mild objective pain during the second session and were without objective pain during the third session, respectively. Also, the subjective pain in their studied sample was moderate or severe before using ice massage at Hoku point while after using ice massage, 46% of them had subjective pain during the second session and 51.9% were without pain during the third session which is in consistent with the present research.

In Sabita et al study (2008), it is also found that the average of objective pain scores in the first and second days of hemodialysis was reduced significantly in the test group (P=0.001), so that it was decreased from 3.8 in the first day

of hemodialysis (without intervention) to 0.7 in the second day of hemodialysis (intervention) (P=0.001). Also, the subjective pain scores were decreased from 2-7 in the first day of hemodialysis (without intervention) to 1-2.5 in the second day of hemodialysis (intervention) which is in consistent with the result of the present study.

In order to compare the average of pain intensity within the needle insertion to arteriovenous fistula in Valsalva maneuver before and after intervention, table 1 shows that the score averages of objective and subjective pains were decreased significantly in Valsalva maneuver group (P<0.001). On the other hand Valsalva maneuver has been effective in decrease of pain intensity due to the needle insertion onto arteriovenous fistula which is in consistent with the results of VR et al study (2013) which was conducted aimed to evaluate the effect of Valsalva maneuver on pain intensity before cannulation of peripheral veins in both 50-individuals control and intervention groups. The results of the above mentioned study showed that the average score of mental pain were 3.98±1.48 and 4.7±1.75 in intervention (Valsalva maneuver) and control groups, respectively. The score average of subjective pain in intervention group was significantly less than control group (P<0.01) which is in consistent with the results of the present study.

In Soltani Mohammadi et al study (2011), the score averages of subjective pain in Valsalva maneuver group was significantly less than control and ball groups (P<0.001) that which is in consistent with the results of the present study. In Suren et al study (2013) aimed to evaluate and compare the effect of using Valsalva maneuver and eutectic mixture of local anesthetics EMLA on pain intensity due to venipuncture on three C, V and E groups, was conducted. The average of pain intensity after venipuncture in group C was evaluated in the range of 0-3.9, while the averages of pain intensities in E and V groups were evaluated as 0-2.7 and 1-2.8, respectively. It was concluded that Valsalva maneuver shows similar results with EMLA in terms of pain reduction within venipuncture which is in consistent with results of the present study. Therefore, both methods of Valsalva maneuver and ice massage had been effective in reducing of objective and subjective pains due to needle insertion to AVF of hemodialysis patients. The researcher worked hard to find other similar studies about the score average of objective pain using Valsalva maneuver, but no research was found to confirm or reject these results.

Based on table 2 in terms of comparing the objective pain intensity within needle insertion to AVF before intervention in both Valsalva maneuver and ice massage groups, Mann-Whitney test results showed that objective pain intensity had no significant difference between two groups (P=0.59). The objective pain rate in Valsalva maneuver group is significantly lower than ice massage group, after intervention (P=0.04). According to the Vagus nerve stimulation during the performance of Valsalva maneuver, it can be said that its stimulation causes a decrease in anxiety and stress [24]. The objective pain rate based on Abbey pain scale in Valsalva maneuver can be probably less than ice massage group.

According to table 3 and in terms of comparing the mental pain intensity within needle insertion to AVF after intervention in both Valsalva maneuver and ice massage groups, Mann-Whitney test results showed that before intervention, the subjective pain intensity due to the needle insertion had no significant difference between two groups (P=0.82). Also, there was not a significant difference between two groups after intervention (P=0.73). Wilcoxon test showed that the subjective pain intensity due to the needle insertion has a significant decrease in both Valsalva maneuver group (P=0.001) and ice massage group (P=0.001).

CONCLUSION

As the result of this study, it can be said that both Valsalva maneuver and ice massage at Hoku point methods reduce the intensity of objective and subjective pains due to the needle insertion in patients undergoing hemodialysis as a simple non-pharmaceutical and cost-effective method, but Valsalva maneuver method reduces the objective pain due to the needle insertion to AVF in these patients more than ice massage method at Hoku point. Thus, this method is recommended for pain management in hemodialysis patients before AVF cannulation.

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