Complementary Therapies in Clinical Practice 20 (2014) 1–4

Contents lists available at ScienceDirect

Complementary Therapies in Clinical Practice

journal homepage: www.elsevier.com/locate/ctcp

The effects of lavender aromatherapy on pain following needle insertion into a fistula in hemodialysis patients

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Keywords:
Aromatherapy
Lavender essence
Pain
Hemodialysis fistulas
Needle insertion

A B S T R A C T

Objective: This study sought to determine the effects of lavender aromatherapy on pain following needle insertion into a fistula in patients undergoing hemodialysis.
Method: This is a randomized controlled clinical trial in which 92 patients undergoing hemodialysis with arteriovenous fistulas were randomly divided into two groups. The experimental-group patients inhaled lavender essence with a concentration of 10% for 5 min during 3 hemodialysis sessions, while the control-group patients received aromatherapy free of lavender essence.
Results: The mean VAS pain intensity score in the experimental and control groups before the intervention was 3.78 ± 0.24 and 4.16 ± 0.32, respectively ($p = 0.35$). The mean VAS pain intensity score in the experimental and control groups after three aromatherapy sessions was 2.36 ± 0.25 and 3.43 ± 0.31, respectively ($p = 0.009$).
Conclusion: Lavender aromatherapy may be an effective technique to reduce pain following needle insertion into a fistula in hemodialysis patients.

1. Introduction

Chronic renal failure is a progressive and irreversible deterioration of renal function which leads to the loss of the body's ability to maintain metabolic and electrolyte balance [1]. In 2005, half a million people in the United States underwent hemodialysis. This number is anticipated to increase to 0.7 million people by 2015 [2]. In 2011, it was reported that 35 thousand Iranians required dialysis and kidney transplantation [3]. Dialysis vascular access is one of the key challenges in dialysis units. Patients undergoing hemodialysis experience anxiety and pain related to the insertion of hemodialysis needles, estimated 320 times in total per year. The pain experienced is mostly caused by needle insertion into a fistula [4], precipitating a considerable amount of discomfort and stress in hemodialysis patients [5,6]. When the pain is well managed, patients more readily accept needle insertion into their fistula, thereby improving their quality of life [7]. Although needle insertion into a fistula causes less pain after the first 3 months, this pain reduction is not significant [8]. Since patients' comfort during hemodialysis is necessary for their long-term compliance with the treatment [5], it is necessary to find pain-relieving methods for hemodialysis patients.

According to other studies, successful techniques to alleviate pain following needle insertion into a fistula include skin stimulation [9] and application of prilocaine cream and lidocaine spray [7]. Moreover, another study examined the effect of cryotherapy on the pain produced by needle insertion into a fistula. According to the study, the Visual Analogue Scale (VAS) pain intensity significantly declined in the experimental group after the cryotherapy [5]. Due to the epidermal barrier, topically administered pain medications are slowly absorbed [7] and frequent use of them can cause skin rashes or allergic reactions [10]. Therefore, it is required to explore other complementary methods of pain relief. Given aromatherapy's pain-relieving effects [11–13] and positive effects on the body, mind and spirit [14], it can be a suitable technique for pain

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http://dx.doi.org/10.1016/j.ctcp.2013.11.005

relief. Aromatherapy is the therapeutic use of essential oils derived from plants. As a complementary therapy, aromatherapy can be used for patients undergoing dialysis. An aromatic species of *labiatae*, lavender is one of the preparations that are used in aromatherapy [15]. Several studies investigated the pain-relieving effects of lavender essence on labor pain [16,17], needle insertion-related pain in healthy volunteers [18] and headaches [19]. There is evidence that aromatherapy may be an effective therapeutic method for anxiety [20,21] and fatigue [22,23] and its sedating and balancing effects have already been reported [24]. Furthermore, lavender essential oil mixed with other essential oils provides relief from itching [25]. It has been shown that lavender boosts the immune system [26] and has relieving effects on muscle aches and certain skin conditions. Lavender is also known for its healing effects specifically on burn wounds [27]. To the best of our knowledge, no published study has explored the effect of lavender aromatherapy on pain following needle insertion into a fistula in hemodialysis patients. Therefore, this study is intended to examine the efficacy of lavender aromatherapy for pain following needle insertion into a fistula in patients on hemodialysis.

2. Methods

This study is a randomized, controlled clinical trial. The study population included all patients with end-stage chronic renal failure admitted to the dialysis unit of two general hospitals in Sari, Iran. There were a total of 200 dialysis patients in the two hospitals, with 108 patients meeting the inclusion criteria of study. Inclusion criteria were as follows: be willing to participate in the study, be treated with dialysis three times a week, be of 18 years old and over, be conscious, have the ability to communicate and have a good sense of smell [28]. The sense of smell was check individually in each nostril with an alcohol swab. Exclusion criteria included kidney transplant candidates, pregnant women, patients with a history of allergies and respiratory diseases [28], patients administered with painkillers in the past 3 h [12] and drug addicts. The sample size was calculated as 46 according to the mean and standard deviation of pain intensity before and after intervention (3.8 ± 0.66, 0.7 ± 0.33) found in the study conducted by Sabitha et al. [5] and 95% the confidence coefficient, with consideration of the likelihood of patient exclusion during the study. A convenience sampling method was used to recruit participants. The sample was randomly allocated in two groups using the Excel RANDBETWEEN Function. The researcher, after selection of subjects, provided them with information regarding the study. All participants signed a consent form in which the study procedures were explained. The patients were approached to solicit demographic data. Box 1 summarizes ethical considerations with the conduct of the study.

Box 1
Ethical considerations.

The study was approved by the ethics committee of the university
The research team obtained approval from the participating hospital
All participants were informed of the confidential nature of the data
All participants were informed that participation would be voluntary and they would be free to decline to answer any questions
All participants were informed that they would be free to withdraw from the study at any time
All participants were encouraged to discuss any questions or concerns about their care or participation
All participants gave consent to research procedures

Two patients from the experimental group declined to participate further in the study at the second intervention and two patients in the control group were excluded because of an acute respiratory disease and stroke. Patients were sampled during morning, evening and night shifts, seven days a week. On the first day (before intervention), the intensity of needle insertion-related pain was measured. The experimental group inhaled lavender essence (at a concentration of 10% for 3 consecutive hemodialysis), produced by Barij Essence Pharmaceutical Company [12]. Given that pure lavender essence is highly concentrated and can cause irritation, the essence was diluted 1:10 with sweet almond oil. A cotton ball soaked in 3 drops of diluted lavender essence was kept at a 10 cm distance from the patients' nose and they were asked to breathe slowly for 5 min [12]. The needle was then inserted into the fistulas. Made by Soha Company (BNO: P 948115 A MFG), needles of the same size and type were used for all patients. The intervention was repeated three times in succession not because of the examination of the lasting effects of lavender essence, but because of the evaluation of the pain following the intervention and the control of confounding factors.

The control group received aromatherapy free of lavender essence (placebo) using the above-mentioned method. Produced by Barij Essence Company, the placebo was composed of the base of lavender-free compound used for the experimental cohort [29]. The placebo was prepared based on the following procedure: a drop of lavender essence was spilled in the basic diluting solution of sweet almond oil, producing the smell of lavender without its properties. The needle insertion-related pain was measured using VAS pain intensity in both groups after each intervention for a total of three times.

Data was analyzed with SPSS (Statistical Package for Social Science, version 16) using multiple regression test, paired *t*-test, independent *t*-test and chi-square test. *P* values less than 0.05 were considered as significant.

3. Results

Forty six patients were enrolled in each of experimental and control groups. The statistical analysis showed no significant differences in age ($t = 1.08$, $p = 0.28$, $df = 90$) and gender ($\chi^2 = 0.7$, $p = 0.4$, $df = 1$) between the two groups. No statistically significant differences were also found between the two groups with regard to the length with a fistula ($t = 0.22$, $p = 0.82$, $df = 90$) (Table 1). A higher proportion of patients in the experimental ($n = 97.8\%$) and control ($n = 91.3\%$) groups were married, with no significant differences between the two groups (Exact test = 1.9, $p = 0.36$, $df = 1$). Secondary school was the highest level of education for 52.2% of the experimental group and a major fraction of the control group was illiterate (39.1%). Despite of the differences in the percentage of educational levels, the Chi-square analysis found no significant differences in the levels of education between the two groups ($\chi^2 = 4.5$, $p = 0.2$). Hypertension was the most common cause of chronic renal failure in

Table 1
Demographic and clinical characteristics of hemodialysis patients.

Variable	Group	
	Experimental group ($N = 46$) mean ± standard error	Control group ($N = 46$) mean ± standard error
Age	60.95 ± 1.93	58.06 ± 1.83
Gender		
Male	52.2%	60.9%
Female	47.8%	39.1%
Disease duration (years)	9.01 ± 1.25	7.28 ± 1.16
Length with a fistula (months)	30.89 + 4.37	32.42 ± 5.37