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Investigating the Effect of Acupressure on Hugo's Point for Venous Catheterization Pain: A Double-Blinded RCT

Amirreza Moradi [1], **Arman Azadi** [2], **Fatemeh Darabzadeh** [2], **Sara Nazarian** [1], **Razyeh Valadbeigi** [1], **Asad Imani** ✉ [,2]

[1] Student Research Committee, Department of Nursing, Faculty of Nursing and Midwifery, Ilam University of Medical Sciences, Ilam, Iran.

[2] Department of Nursing, Faculty of Nursing and Midwifery, Ilam University of Medical Sciences, Ilam, Iran.

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✉ ***Correspondence to:***
Asad Imani
Department of Nursing, Faculty of Nursing and Midwifery, Ilam University of Medical Sciences, Ilam, Iran.

Email:
imani.nursing@gmail.com

A B S T R A C T

Introduction: Hugo point massage is a non-pharmacological method suggested to reduce pain, commonly experienced after invasive procedures. This study aimed to assess the effect of Hugo point massage on pain caused by venous catheterization.

Materials and Methods: In this double-blinded RCT, 68 surgical candidates meeting the inclusion and exclusion criteria were randomly assigned to control and intervention groups via dice rolling. The intervention group received a three-minute Hugo point massage before venipuncture in the antecubital area, performed by a nurse. The control group underwent standard venipuncture by the same nurse. Pain was assessed using the Numerical Pain Rating Scale (NPRS) before, during, and five minutes after venipuncture. Statistical analyses, including Chi-square, Repeated Measure ANOVA, Fisher's Exact Test, Post Hoc, and Kolmogorov-Smirnov tests, were conducted using SPSS v.16 with a significance level of $P<0.05$.

Results: The mean age of participants was 51.47 ± 4.28 years. Pain intensity scores (Mean ± SD) were significantly lower in the intervention group (4.33±0.42) compared to the control group (8.21±1.03). No significant differences were observed between the groups before the intervention, but a significant reduction in pain was noted five minutes after venipuncture in the intervention group ($P<0.05$).

Conclusion: A three-minute Hugo point massage before venipuncture significantly reduces catheterization pain.

Keywords: Acupressure, Catheterization, Massage, Pain

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Introduction

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Pain is a common and distressing experience often caused by illness or medical procedures. Relief from pain can be achieved through pharmacological or non-pharmacological methods (1). Pain prompts organisms to avoid dangerous and unpleasant stimuli, playing a critical role in survival. However, pain frequently loses its warning function. Several factors influence pain intensity, quality of life, response to treatment, and disability levels. Pain is one of the most frequent complaints leading to primary health care visits, incurring substantial costs for treatment or relief (2). Nurses play a key role in pain management due to their expertise in assessment, drug administration, and patient education. Their continuous presence at the bedside positions them as primary pain managers. Clinically, pain is a subjective and highly personal experience, defined by the individual experiencing it. Regardless of its presence, the patient's report is the most reliable indicator of pain and the cornerstone of pain assessment (3). Inadequate pain control can lead to complications such as tachycardia, increased blood pressure, myocardial ischemia, decreased alveolar ventilation, pneumonia, deep vein thrombosis, infection, delayed treatment, and chronic pain. Poor pain management can result in shallow breathing, reduced mobility, and increased fatigue, impacting daily activities and basic self-care (4). Peripheral intravenous catheter insertion, one of the most painful and common nursing procedures, is widely used across hospital departments. Studies show that pain is the most common patient reaction during venipuncture, with about 40% of adults avoiding blood draws due to needle fear. Despite extensive research on pain reduction and various proposed solutions, the issue remains unresolved (5).

Medication, particularly opioids, is commonly used for pain relief, especially in moderate to severe cases, but these drugs can cause dizziness, nausea, vomiting, physical dependence, tolerance, and respiratory depression. Consequently, many doctors and patients supplement drug treatments with non-drug methods to manage postoperative pain. Although there is a wide range of non-pharmacological pain control methods, data on their clinical use remain limited despite frequent recommendations. Non-pharmacological approaches can be categorized into four groups: 1) passive physical methods like acupuncture, massage, percutaneous electrical nerve stimulation, and hot or cold compresses; 2) physical activities such as walking, deep breathing, or light to moderate exercise; 3) psychological-spiritual approaches, including prayer; and 4) distractions, such as watching TV or listening to music (3). The word "massage" originates from Greek, meaning to handle, touch, work with hands, or knead. Massage is widely regarded as a safe treatment method with minimal risks or side effects and is recommended by the Society of Physiotherapy for managing various pain-related conditions, particularly those of musculoskeletal origin. Hugo's point (L4), located at the middle of the bisector of the angle between the first and second metacarpals of the hand, is considered the most important pain point in the body. This point is where energy flow is closest to the skin's surface, making it easily controlled by pressure. Stimulation of Hugo's point, whether through pressure, needles, or cold (cryotherapy), can reduce pain throughout the body (6). Hugo's point is especially effective in pain relief. Stimulating this point can alleviate pain in any part of the body, with cryotherapy at Hugo's point being particularly effective in reducing the pain associated with needle insertion into the arteriovenous fistula region, even more so than pressure alone. This method is simple to teach, enabling nurses to help patients manage their pain effectively (7).

Despite the potential benefits, no study has yet investigated the effect of massage therapy at Hugo's point on venous catheter pain in hospitalized patients. Therefore, this study aims to determine the effect of Hugo point massage therapy on pain caused by venous catheterization in patients.

Materials and Methods

Study design

This clinical trial (IRCT20211012052746N1) was conducted with 68 participants at Imam Khomeini Hospital in Ilam. The sample selection method was simple randomization; a set of 68 random numbers was generated and assigned to patients entering the respective departments. Each patient corresponding to a selected number was included in the study. Participants were then randomly divided into two groups: 1) Control group (34 participants) and 2) Intervention group (34 participants). Efforts were made to match the groups based on factors such as age and gender.

Sample size

To calculate the sample size for each group, data from a similar study were used, in which the mean (standard deviation) pain scores before and after the intervention were 2.6 (1.1) and 2.5 (0.8), respectively (8). Considering a type 1 error rate of 0.05 and a test power of 0.80, the sample size for each group was determined using the formula for comparing means. The required sample size was calculated to be 27 participants per group. To account for a 25% attrition rate, the final sample size was adjusted to 34 participants per group

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(68 in total). All 68 participants remained in the study until its conclusion, and data analysis was conducted on the entire sample.

$$N = (Z_{1-\alpha/2} + Z_{1-\beta})^2 \, (\sigma_1^2 + \sigma_2^2) / (m_1 - m_2)^2$$

$$= (1.96+0.842)^2 \ ((0.8)^2 + (1.1)^2) / (6.2 - 5.2)^2 = 27 * 0.25 = 34$$

Participants, Randomization and Blinding

Inclusion criteria included the desire to participate in the study, age between 18 and 65 years, the ability to communicate verbally, and a Mini-Mental Status Examination (MMSE) score of 24 or higher. Exclusion criteria included a history of venipuncture in the last 4 weeks, a Numerical Pain Rating Scale (NPRS) score of 6 or higher before venipuncture, diagnosed diabetes, smoking, use of oral or intravenous painkillers within eight hours, history of fractures in the shoulder, arm, forearm, or wrist, fractures or inflammation at the massage point, multiple venipunctures in the target area, venipuncture lasting more than one minute, a Glasgow Coma Scale (GCS) score below 14, and a history of chemotherapy or dialysis. After meeting these criteria, informed written consent was obtained from all participants. Randomization occurred after confirming participants met the inclusion and exclusion criteria. For group allocation, a dice was rolled for each participant upon entry into the study. If an odd number was rolled, the participant was assigned to the intervention group; if even, to the control group. This process continued until all participants were allocated. The nurse performing the procedure was not involved in data collection, and the statistical analyst was blinded to the study's aim and received coded data for analysis.

Ethical considerations included obtaining an ethics code (IR.MEDILAM.REC.1400.141), maintaining integrity in data collection and reporting, securing written informed consent from all participants in line with the Declaration of Helsinki, and adhering to guidelines for human intervention.

Measuring tools, Validity and Reliability

1. Questionnaire of demographic information

This included variables such as gender, marital status, education level, number of children, and employment status.

2. Mini-Mental Status Examination (MMSE)

Designed by Folstein et al., this tool assesses cognitive impairment and includes 17 questions. The maximum score is 30, with a cutoff score of 24. Scores of 24 and above indicate no cognitive impairment, 18 to 23 indicate mild impairment, 10 to 17 indicate moderate impairment, and scores below 10 suggest Alzheimer's disease. The original tool's validity and reliability, with a cutoff score of 24, showed a content validity index (CVI) of 0.91 and a Cronbach's alpha of 0.941. In Iran, its reliability, measured by Cronbach's alpha, was 0.786, with a CVI of 0.81 (9).

3. Numerical Pain Rating Scale (NPRS)

This tool was designed by Flaherty et al. to assess pain intensity through self-reporting, using a scale from zero (no pain) to ten (worst possible pain). The original version of this tool demonstrated a content validity index (CVI) of 0.79 and a Cronbach's alpha internal consistency coefficient of 0.964. In its adaptation for use in Iran, the reliability of the NPRS was confirmed with a Cronbach's alpha coefficient of 0.807, and the CVI was reported as 0.76 (10).

4. Glasgow Coma Scale (GCS)

Created by Teasdale et al., this scale measures consciousness levels across three indices: visual response (4 points), verbal response (5 points), and motor response (6 points). Scores range from 3 (no consciousness) to 15 (full consciousness). The original tool's CVI was 0.96, with a Cronbach's alpha of 0.733. In Iran, the reliability had a Cronbach's alpha of 0.820 and a CVI of 0.84 (11). To assess the reliability of these questionnaires in this study, they were administered to 30 individuals meeting the inclusion and exclusion criteria. The Cronbach's alpha coefficients for MMSE, NPRS, and GCS were 0.796, 0.877, and 0.864, respectively.

Intervention

After receiving the ethics code, clinical trial registration, and completing reliability assessments, sampling began. Participants were randomly allocated to the control or intervention groups by dice throw. Demographic questionnaires, MMSE, GCS, and NPRS (to determine baseline pain before venipuncture) were completed by a blinded research team member and recorded online in coded form. A skilled nurse performed all venipunctures to minimize bias.

In the intervention group, participants received a three-minute massage on the Hugo point of the hand, where the vein would be accessed, using medium pressure (enough to blanch the nurse's nail bed). The massage stopped during catheter insertion, and participants rated their pain on a scale of 1 to 10. Five minutes after catheter insertion, participants reported their pain level again. The control group underwent standard venipuncture by the same nurse, with pain

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questionnaires completed before, during, and five minutes after the procedure (Figure 1).

Statistical and Data analysis

Statistical analyses were performed using SPSS V.16. Tests included Mean, Standard Deviation, Chi-square, Repeated Measure ANOVA, Exact Fisher test, Post Hoc (LSD), and Kolmogorov-Smirnov. A significance level of 0.05 was used. After data collection, the coded questionnaires were analyzed by a blinded statistician. Descriptive and inferential statistical tests, including Chi-square, Repeated Measure ANOVA, Fisher-Freeman Halton, LSD, and Kolmogorov-Smirnov, were conducted using SPSS version 16, with a significance threshold of $P<0.05$.

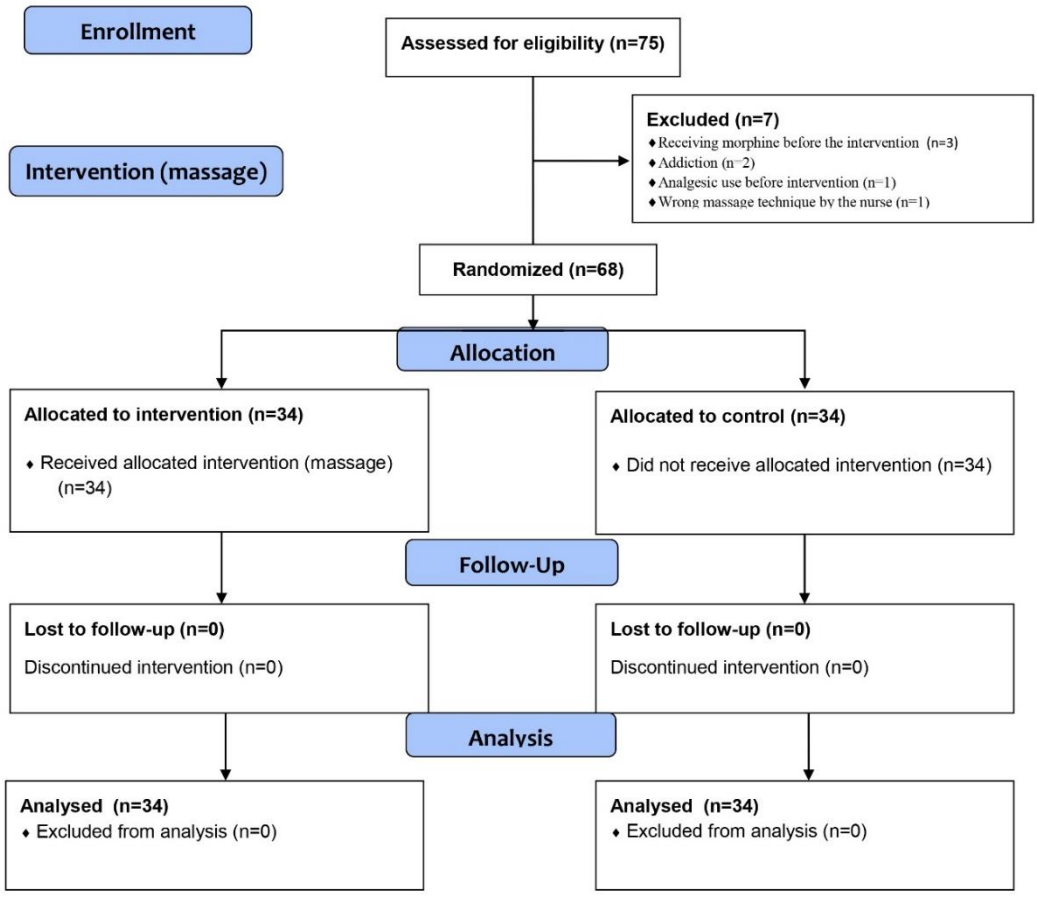


Figure 1. CONSORT Flow Diagram of Participant Enrollment, Randomization, and Analysis.

Results

First, the Kolmogorov-Smirnov test was conducted, revealing that the data were normally distributed. The mean age of the participants was 51.47 ± 4.28. The majority of participants were male, married, had a diploma-level education, had one to three children, and were employed. The chi-square test showed no significant differences between the demographic variables of the control and intervention groups (Table 1).

Table 1. Demographic Characteristics of Participants in Control and Intervention Groups

Variable		Intervention	Control	P Value (Chi-Square)
Gender	Man	18(%53)	22(%65)	0/493
	Woman	16(%47)	12(%35)	
Marital Status	Single	12(%35)	7(%21)	0/701
	Married	20(%35)	19(%55)	
Degree of Education	Secondary School	3(%9)	2(%6)	0/519
	High School	2(%6)	4(%12)	
	Diploma	23(%67)	15(%44)	

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	Postgraduate	6(%18)	13(%38)	
Kids	No kid	13(%38)	7(%21)	0/817
	1 to 3	19(%56)	21(%61)	
	Above 3	2(%6)	6(%18)	
Occupation	Free	20(%59)	18(%53)	0/399
	Employed	10(%29)	13(%38)	
	Retired	4(%12)	3(%9)	

There was no significant difference in pain intensity between the control and intervention groups before the intervention (P=0.104). However, during catheter insertion and five minutes after, significant differences were observed (P=0.041 and P=0.023, respectively). In the control group, the average pain intensity scores increased, indicating worsening pain, whereas in the intervention group, scores initially increased but then decreased, suggesting an improvement in pain. Analysis of variance with repeated measures revealed a statistically significant difference in the changes in average pain intensity scores between the control and intervention groups throughout the study period (P<0.001) (Table 2).

Table 2. Comparison of Average Pain Intensity Levels Before, During, and Five Minutes After Catheter Insertion in Control and Intervention Groups

Variable		Mean ± Standard Deviation			P Value (Exact Fisher test)			One Way Repeated Measure ANOVA P Value		
		T0	T1	T2	T0	T1	T2	Group effect	Time effect	Interaction time*group
Pain	Control	2.17 ± 0.86	7.69 ± 0.11	8.21 ± 1.03	P=0.104	P=0.041	P=0.023	F=11.307 (P<0.001)	F=29.68 (P<0.001)	F=55.36 (P<0.001)
	Intervention	2.49 ± 0.64	5.14 ± 1.15	4.33 ± 0.42						
T0= Before the insertion of the catheter *T1= During the insertion of the catheter* *T2= Five minutes the insertion of the catheter*										

The comparison of average pain intensity scores across the three time periods revealed that in the control group, pain intensity increased over time, whereas in the intervention group, pain intensity decreased. The LSD post hoc test demonstrated that the Hugo point massage had a statistically significant effect on pain intensity in the intervention group, indicating that the effect of the intervention persisted over time (P<0.001). In contrast, the control group did not show statistically significant changes in pain intensity over time (P=0.072, P=0.097, P=0.116) (Table 3).

Table 3. Average Pain Intensity Scores Before, During, and Five Minutes After Catheter Insertion in Control and Intervention Groups

Outcome	Group	Time		Mean difference	P Value*
Pain	Control	T0	T1	*-5.52*	*0.072*
			T2	*-6.04*	*0.097*
		T1	T2	*-0.52*	*0.116*
	Intervention	T0	T1	*-2.65*	*P<0.001*
			T2	*-1.84*	*P<0.001*
		T1	T2	*0.81*	*P<0.001*
T0= Before the insertion of the catheter T1= During the insertion of the catheter T2= Five minutes the insertion of the catheter *Post hoc (LSD)					

Discussion

The objective of the present study was to evaluate the effect of Hugo point massage on pain severity during venous catheter insertion in individuals being admitted to the hospital. The results revealed a statistically significant reduction in average pain intensity scores in the intervention group compared to the control group following the massage. This indicates that Hugo point massage effectively alleviated pain during catheter insertion. These findings are consistent with the

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research by Pour Ramezani et al., who investigated the impact of cryotherapy with ice applied to the Hugo point on pain during hemodialysis catheter insertion. Their study found that targeted cold therapy at the Hugo point reduced pain intensity, paralleling our results (12). Similarly, Jafari-Koulaee et al. studied cyclic cold therapy at the Hugo point and found it reduced pain during hemodialysis catheter insertion, supporting the effectiveness of interventions at the Hugo point (13). Their study also focused on interventions before and during catheter insertion but did not address cognitive status or pain assessment after five minutes, which were considered in our study. Conversely, Ogul et al. compared massage and ice at the Hugo point for pain reduction during catheter insertion in children with thalassemia and found that massage was less effective than ice, contrary to our findings (14). This discrepancy could be due to differences in age, gender, pain assessment methods, intervention duration, or venipuncture techniques. Furthermore, Sharabiani et al. compared Emla cream and Hugo point massage for pain in pediatric patients and found Hugo point massage to be effective, though not as effective as Emla cream in reducing pain (15). Both studies used similar tools for pain assessment and massage techniques. Rajabi et al. compared cold therapy with ice and heat therapy with warm compresses for pain relief in hand fractures and found that ice therapy significantly reduced pain (16). This aligns with our study's conclusion that Hugo point massage is effective in reducing pain severity following invasive procedures. Overall, both studies and our research demonstrate that Hugo point massage is a valuable method for alleviating pain from invasive treatments. One advantage of acupressure treatments, such as Hugo point massage, is that they provide a low-cost and non-invasive option for pain relief in various body areas (17). The current study's findings are consistent with Ebrahimi et al.'s research, which examined the effect of Hugo point massage on pain from hot flashes in postmenopausal women. Their study also demonstrated that clockwise massage at the Hugo point reduced discomfort among participants (18). Both studies utilized the same technique, involving pressure on the Hugo point in a clockwise direction, and included participants without cognitive impairments. Additionally, Oliveira et al. investigated the impact of Hugo point massage on daily pain intensity in fibromyalgia patients. They found that performing a moderate, circular massage 12 times a day for 5 minutes each session reduced daily pain levels, aligning with our study's results (7). Both studies support the effectiveness of Hugo point massage as an accessible and personalized method for managing chronic pain. Moreover, Fasihi et al. examined Hugo point massage in the context of pulmonary drainage and found that a 10-minute massage every 2 hours reduced breath and pain severity, which is consistent with our findings (2). Both studies highlight that Hugo point massage is a low-cost, accessible intervention suitable for various medical settings. This study's limitations include its time frame, sample size, and the specific demographic studied. Notably, the research focused on patients without cognitive impairments, those not undergoing dialysis or chemotherapy, and employed a double-blinded design.

Conclusion

Administering Hugo point massage before and during venipuncture in hospitalized patients with full cognitive function effectively reduces the discomfort associated with catheter insertion. This study demonstrates that a three-minute massage at the Hugo point significantly alleviates pain during catheter placement. Future research should involve larger sample sizes, explore other disorders with similar symptoms, and consider various venous access methods.

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Conflict of interest

The authors declare no conflicts of interest.

Authors' Contributions

Conceptualization, Methodology, Validation: AI, AM, FD, Formal Analysis, Investigation, Resources: RV, SN, Data Curation, Writing– Original Draft Preparation, Writing– Review & Editing: AI, AA, AM, Visualization, Supervision, Project Administration: AI, AM.

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