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# Comparison of the effect of local pressure in the dorsogluteal region and Hugo point massage with pain intensity induced by intramuscular injection

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**ABSTRACT**

**Background:** Intramuscular injection is a painful process that can cause severe fear in women. As a result, fear of injection can disrupt the treatment process. Therefore, the present study was performed to assess the effect of local pressure in the dorsogluteal region and Hugo point massage on the severity of pain caused by intramuscular injection in women.

**Methods:** The present study was a clinical trial that was performed on 81 female patients referred to the injection unit of Allameh Bohloul Gonabadi Hospital in 2019. Participants were selected according to inclusion criteria and were randomly assigned to two intervention groups (dorsogluteal region local pressure and Hugo point massage groups) and one control group based on permutation block randomization. Data collection tools included demographic information form and visual pain scale. Central tendency indices and statistical tests (Kruskal-Wallis, Majorca and Mann-Whitney) were used to analyze the data. Significance level was considered as $p < 0.05$.

**Results:** The results showed that after the intervention, the mean pain intensity in both of the intervention groups was significantly lower than the control group ($p = 0.007$), but there was no significant difference in mean pain intensity between the intervention groups ($p = 0.68$).

**Conclusion:** Local pressure in the dorsogluthal region and Hugo point massage with ice can effectively reduce intramuscular injection site pain, but none of the methods were superior to other in reducing pain.

**Keywords:** Intramuscular injection, Pain measurement, Pain management, Massage.

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## Introduction

Pain is a multi-dimensional phenomenon and it is difficult to define as pain is a sensory and individual experience and my not be experienced similarly by individuals. International Association for the Study of Pain defines pain as an unpleasant sensory and emotional experience with an actual or potential tissue injury (1). Intramuscular injections are considered as a cause of pain. Although intramuscular injections have been incorporated into many management protocols, their complications, including injection site pain, have been neglected (2, 3). Intramuscular injection is a painful process that can cause severe fear to patients and disrupt the treatment process (4). Therefore, it is one of the responsibilities of the treatment staff to consider ways to reduce this intramuscular injection site pain (3).

Pain relief interventions can be implemented though pharmaceutical and non-pharmacological methods (5). Although pharmacological treatment is the easiest method available to reduce pain, non-pharmacological interventions that can be performed by nurses can help relieve pain while creating less risk for the patient (6). Non-pharmacological pain relief techniques are safe, non-invasive, and cheap strategies that are within the framework of independent nursing functions (7). Various non-pharmacological methods, including of local cold or heat, music therapy, distraction, and massage (8). Complementary medicine, including acupuncture, is a non-pharmacological method that has attracted patients and health care workers in recent years (9).

Acupressure is a branch of complementary medicine that produces its effects through the stimulation of acupuncture points by applying soft and continuous pressure using the hand, fingers or thumb (9) and it is a harmless and non-invasive form of acupuncture, and it is much easier to use (10).

Hugo's point is the most important point for pain relief and can be administered for all painful situations (11). Hugo’s point is located in the middle of the bisector of the angle between the first and second metacarpals. In traditional medicine, the flow of energy is believed to be close to the skin at this point and it can be easily stimulated by pressure, needles or extreme cold (11). According to the gate control theory of pain, stimulating the skin through massage, needles and pressure can stimulate large fibers that transmit nerve impulses to the spinal cord, and as a result, stimulating these points can keep the gates of pain transmission closed and reduce the sense of pain (12).

Although various pain relief methods exist, the studies on the effects of these methods in pain reduction reported controversial findings and the underlying mechanism for many of these methods are not yet understood (13). Furthermore, reducing pain in intramuscular injections can improve patient satisfaction and the quality of medical care. Therefore, the present study was designed and conducted with the aim of comparing the effect of two methods, including local pressure and Hugo point massage with ice, on the intensity of intramuscular injection site pain.

## Methods

### *Research design*

This study was a randomized clinical trial, which was approved by the Research Ethics Committee of Gonabad University of Medical Sciences (code: IR.GMU.REC.1398.081) and was registered in the Iranian Registry of Clinical Trials (code: IRCT20191217045772N1). The study was conducted on women who were prescribed intramuscular Neurobion injection and were referred to the injection unit at Allameh Bohloul Gonabadi Hospital in 2018. Written consent was obtained from all patients.

### *Sample size*

The study sample size was calculated using Gpower software version 3.1.9.2 and F test family and Fixed effects: ANOVA effects, omnibus, one way test considering the confidence factor of 95%, the test power of 80%, and the effect size of 65%. Sample size was calculated as 27 participants in each group (total of 81 participants).

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### *Participants*

Inclusion criteria were age between 18 and 50 years old, lack of stiffness, sensitivity, or lesion at the injection site; no severe disease, injection site pain due to disease, no injection in the mentioned area one week before the study, having full consciousness, and being able to respond and determine the amount of pain based on the visual pain scale, acceptable hearing ability and vision; being able to communicate. The exclusion criteria were having injection site pain before intramuscular injection, receiving narcotic and/or non-narcotic pain killers 2 hours before injection, being pregnant, and any new medical condition that limited intramuscular injection during the intervention and examination of the subjects or could affect pain sensation. The inclusion and exclusion criteria were evaluated based on interview with patients and self-report and physical examination by the researcher.

### *Samling and randomization*

Sampling was performed in two stages. First, patients were selected based on convenience and purposive sampling based on eligibility criteria. Then, participants were randomly assigned to each of the three groups, including local pressure, Hugo's point massage, and control groups, using multi-level permutation blocks with block size of three. All possible conditions were listed, registered and drawn as sealed envelopes, so that for each participant an envelope was randomly selected and the obtained block was returned to the container after registration.

### *Research instruments*

Two instruments were used in this study, including personal information questionnaire and the visual pain scale. Visual pain scale is in the form of a 10 cm horizontal or vertical line that starts from no pain at point zero and ends at point 10 indicating the most severe or intolerable pain. Pain intensity was divided into four groups: no pain, mild pain, moderate pain, and severe pain based on the visual pain scale. The validity and reliability of this tool has been examined and confirmed in various studies. This tool has been used in many national studies on different patients and conditions (14).

### *Intervention*

Participants in the intervention group 1 received local pressure while participants in the intervention group 2 received massage with ice on the Hugo's point massage. Pressure was applied in both intervention groups was defined based on the suggestion of an acupressure specialist as equivalent to the 3kg pressure by pressing thumb on a scale. The control group received intramuscular injection without any further intervention. Patients were placed in supine position for intramuscular injection. Intramuscular injection was performed based on a standard method in all participants. The injection site was cleaned with cotton dipped in alcohol for 15 seconds before the injection, and the needle was inserted into the skin at a 90-degree angle, then the 3 ml drug was injected using a 5cc syringe with 22 G needle (Soha Company, Iran) at a rate of 1 cc per 10 seconds. In all cases, the injection was performed by a trained nurse. The intervention in the test and control groups was carried out by the researcher, and the pain measurement tool was completed immediately after injection by another nurse who was already familiar with the study method and was not aware of the allocation groups.

In the intervention group 1, local pressure was applied using the thumb at the injection site for 10 seconds until the patient felt no pain, and then the injection was performed immediately. In intervention group 2, the Hugo point was determined by the thumb at the peak of the ridge created by adductor thumb muscle (Figure 1). Hugo's point was massaged using an ice ball wrapped in a plastic glove and a single-layer cotton cloth in a clockwise direction for one minute. Soft and continuous pressure of 3 kg per square meter was applied on the Hugo's point on the right hand. Massage was repeated twice more with 30 seconds time gap in between. The intervention time was 5 minutes.

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### *Statistical analysis*

The normality of quantitative variables was determined evaluated using the Kolmogrove-Smirnov test. The intensity of pain was divided into three groups. Comparison of quantitative variables were evaluated using the Kruskal-Wallis and Mann-Whitney tests with Bonferroni correction due to the non-normality of the data. P value less than 0.05 was considered significant.

### *Ethical consideration*

The study protocol was approved by the Research Ethics Committee of Gonabad University of Medical Sciences (code: IR.GMU.REC.1398.081) and was registered in the Iranian Registry of Clinical Trials (code: IRCT20191217045772N1). All participants provided a written informed consent before participating in the study and were free to refuse to participate in the study at any time.

## Results

In this study, data of 81 participants in three groups (n=27), including local massage group (intervention group 1), Hugo point massage with ice group (intervention group 2), and the control group were analyzed. Comparison of demographic characteristics of the participants between the study groups are presented in table 1 and figure 1. Mean age in the intervention groups 1 and 2; and in the control groups were 33.44 ± 9.52, 32.59 ± 9.39, and 32.96 ± 10.07 years old, respectively. Mean BMI in the intervention groups 1 and 2; and the control groups were 23.46 ± 4.55, 24.31 ± 3.84, and 22.96 ± 3.02 kg/m$^2$, respectively. There was no significant difference in age (p=0.96) and BMI (p=0.43) between study groups. The participants in the three studied groups were statistically homogeneous in terms of individual variables, including age, sex, BMI, educational status, marital status, and occupation (table 1).

Comparison of the pain intensity between the study groups is presented in table 2 and 3. There was a statistically significant difference in the pain intensity score between group (p=0.007) in a way that the pain intensity score in both the intervention groups 1 (p=0.040) and 2 (p=0.004) were significantly lower than the control group. However, there was no significant difference in the pain intensity score between intervention groups 1 and 2 (p=0.440).

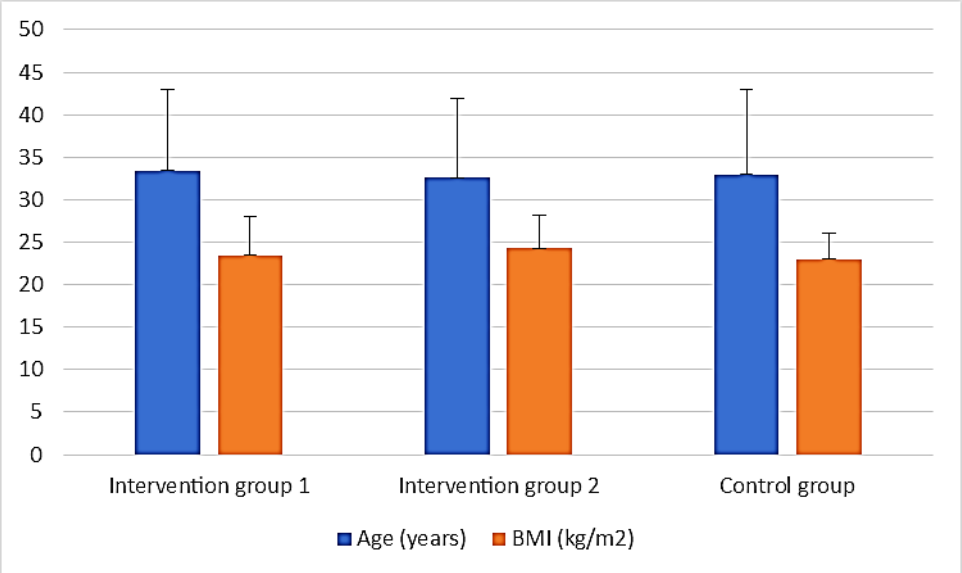


**Figure 1. Participants' age and BMI as per study groups.** Intervention group 1: local pressure, intervention group 2: Hugo's point massage, Control group: no intervention.

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**Table 1. Comparison of demographic characteristics between the study groups**

| Variable | | Intervention group 1 Frequency (%) | Intervention group 2 Frequency (%) | Control group Frequency (%) | p ǂ |
|---|---|---|---|---|---|
| **Education level** | Primary | 5 (18.5%) | 4 (14.8%) | 6 (22.2%) | 0.16 |
| | Some secondary | 2 (7.4%) | 3 (11.1%) | 5 (18.5%) | |
| | Secondary/ Diploma | 6 (22.2%) | 9 (33.3%) | 12 (44.4%) | |
| | Bachelor and above | 14 (51.9%) | 11 (40.7%) | 4 (14.8%) | |
| **Marital status** | Single | 9 (29.6%) | 7 (25.9%) | 3 (11.1%) | 0.22 |
| | Married | 19 (70.4%) | 20 (74.1%) | 24 (88.9%) | |
| **Occupation** | Employee | 9 (33.3%) | 7 (25.9%) | 1 (3.7%) | 0.01* |
| | Housewife | 10 (37.0) | 12 (44.4%) | 21(77.8%) | |

SD: Standard deviation, BMI: Body Mass Index.

† The Kruskal-Wallis test was used for the comparison.

‡ The one-way analysis of variance was used for the comparison.

ǂ The chi-square test was used for the comparison.

**Table 2. Comparison of the pain intensity score between the study groups**

| Variable | Intervention group 1 Mean ± SD | Intervention group 2 Mean ± SD | Control group Mean ± SD | p |
|---|---|---|---|---|
| **Pain intensity** | 3.49±2.32 | 2.92±2.11 | 5.07±2.80 | 0.007* |

SD: Standard deviation

The Kruskal-Wallis test was used for the comparison.

* Statistical significance

**Table 3. Comparison of pain intensity between intervention groups and control group**

| Variable | Intervention group 1 Mean ± SD | Intervention group 2 Mean ± SD | Control group Mean ± SD | p Group 1 vs group 2 | p group 1 vs control | p group 2 vs control |
|---|---|---|---|---|---|---|
| **Pain intensity** | 3.49±2.32 | 2.92±2.11[b] | 5.07±2.80 [b] | 0.440 | 0.040* | 0.004* |

SD: Standard deviation

The Mann-Whitney test was used for the comparison.

* Statistical significance

## Discussion

This study was conducted with the aim of comparing the local pressure of the dorsogluteal region and Hugo point massage with ice on the intensity of pain caused by intramuscular injection. This study showed that the three studied groups experienced different pain intensity during intramuscular injection. While both intervention methods reduced injection site pain intensity, no statistically.

A study conducted to evaluate the effect of injection site pressure on intramuscular (deltoid) vaccine injection pain on 74 students in Hong Kong in 2001 also showed that local pressure reduced pain intensity (15). The effect of local pressure on intramuscular injection site pain was also reported in

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previous studies (16-18). Another study showed that applying pressure with multiple slow acupressure sticks on the skin was effective in reducing the pain of intramuscular injection, which was in line with the results of our study (1). A study on 12-15 year-old children showed that local pressure was more effective in reducing intramuscular injection site pain (19).

The findings of our study added to the current research findings that indicate the effectiveness of local pressure in reducing intramuscular injection site pain. Local pressure application can be implemented by massage, heat or cold application. According to the gating theory of pain, local stimulation of greater number of peripheral receptors (distraction) reduces the transmission and perception of injection site pain (8, 20). Therefore, it can be concluded that the local pressure applied in our study might have had its pain reducing effect through this theory.

This study findings also showed that Hugo point message with cold ice ball reduced intramuscular injection site pain compared to the control group. A previous study finding also showed that Hugo point massage with and without ice reduced intramuscular Pentavalent vaccine injection site pain in infants (21). Similar finding was reported in another study that applied message with ice on the Hugo point and reported vaccination injection site pain in infants (22). Although the mentioned studies was conducted on infants, who were in a different age group compared to the present study, and the injection site was different from our study (middle, anterior, outer third of the thigh muscle vs dorsogluteal muscle), the results of our study were in line with the mentioned studies. Although this study was conducted in toddlers, it is consistent with the results of our study. In terms of the effects of Hugo point massage with ice on pain in adults, a study on hemodialysis patients reported that the effect of Hugo point massage with ice reduced pain due to needle insertion into arterio-venous fistula (23). The effect of massage with ice was previously compared with Hugo point massage in previous studies and reported that massage with ice could reduce venipuncture site pain compared to Hugo point massage (24). The reason for this finding may be due to the direct stimulation of delta A fibers due to cold application that might result in a more powerful pain reducing effect (25). Research also shows that cold application effectively blocks the sensory fibers communication in the nervous system (26). Furthermore, ice massage may have its pain reducing effects through the involvement of the pain valve control system (27). Based on the pain valve control system theory, impulses caused by vibration, itching and ice massage reach the posterior horn of the spinal cord, control the passage of pain to higher brain centers (like a valve) and thus leads to pain reduction (28). Hugo point massage with ice was reported to be effective in reducing pain due to causes other than injection (29, 30).

## Conclusion

This study findings indicated that Hugo point massage with ice and local pressure of the dorsogluteal area can be considered as available and acceptable method in reducing intramuscular injection site pain in women. Therefore, based on these findings and considering the similar effect of both methods on pain reduction, any of these methods can be implemented in reducing injection site pain based on the patient conditions by health care service providers.

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**Conflicts of interest:** The authors declare no conflicts of interest.

**Data availability:** The data that supports the findings of this study are available from the corresponding author upon reasonable request.

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