



Research Article

The Effect of Manual Acupressure (Point BL32) on Pain Associated with Intramuscular Injections of Magnesium Sulfate

Seyed S. Najafi¹, Setareh Nazaribin², Marzieh Momennasab^{1,*},
Amin Kordi Yoosefinejad³

¹ Department of Nursing, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran

² Student Research Committee, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran

³ Physical Therapy Department, School of Rehabilitation Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

Available online 22 July 2018

Received: May 15, 2018

Revised: Jul 6, 2018

Accepted: Jul 17, 2018

KEYWORDS

acupressure;
eclampsia;
intramuscular;
magnesium sulfate;
pain;
Z-track technique

Abstract

The aim of this study was determining the effect of acupressure on the severity of pain associated with intramuscular injections of magnesium sulfate administered by the Z-track technique in patients with eclampsia and preeclampsia. Forty-eight patients participated in this single-group clinical trial, which was conducted in three stages. For each patient, three intramuscular injections were administered by the Z-track technique. The first injection was administered by the conventional method. The second injection at a sham control point and the third injection using acupressure (BL32) were administered. Pain severity was measured on a visual analogue scale. The mean pain intensity was 7.22 in the first, 4.75 in the second and 1.94 in the third injections ($p < 0.001$). The results of the study showed that acupressure at the BL32 point before intramuscular injection of magnesium sulfate significantly reduced the injection-related pain.

* Corresponding author. Department of Nursing, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Zand Street, Namazee Square, Postal Code: 7193613119, Shiraz, Iran.

E-mails: najafisa@sums.ac.ir (S.S. Najafi), setare1991_2013@yahoo.com (S. Nazaribin), momennasab@sums.ac.ir (M. Momennasab), yoosefinejad@sums.ac.ir (A. Kordi Yoosefinejad).

pISSN 2005-2901 eISSN 2093-8152

<https://doi.org/10.1016/j.jams.2018.07.002>

© 2019 Medical Association of Pharmacopuncture Institute, Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Although intramuscular (IM) injection is among the common techniques for delivering medications [1], it can lead to pain and discomfort in patients [2]. The results of one study showed that 40% of patients who received IM injections described their experience as very painful [3]. In some cases, this causes severe consequences such as avoidance for next necessary injections specifically because 7–22% of general population suffers from injection phobia [4]. Although this type of injection has been used for more than half a century, there is a paucity of evidence-based practices because extensive research has not yet been carried out to study different interventions for pain reduction [5].

Injection is mainly undertaken by nurses, and when nurses underestimate the patients' severity of pain, patients may stop seeking treatment [6]. Since pain can destroy the nurse–patient relationship, using different techniques for pain reduction can improve patient care and satisfaction. Numerous nonpharmacological methods such as the use of massage in the area after the injection [7], cooling the area prior to injection [8], acupressure, and cold therapy [9] have been studied to reduce the pain resulting from injections. However, most of the studies were carried out on pain resulting from nonmuscular injection or venipuncture, and limited research has been conducted on pain caused by IM injection [10].

Acupressure is an ancient Chinese therapy in which points located in different meridians are stimulated by pressure, using hands, fingers, and thumb. Acupressure maintains the normal functions of the body and enhances well-being by restoring body energy and maintaining harmony via promoting blood circulation and neurotransmitters secretion [11–13]. Acupressure can reduce pain by stimulating the body to produce and release opioid, peptides, and endorphins [12]. Since acupressure is noninvasive, it is ideal for those who are afraid of needles [14]. Moreover, patients can learn and perform it by themselves easily [15]. The points used for back pain, sexual and genitourinary problems, erection disorders, and disorders of the lower extremities are known as the eight liao points, which include four symmetrical points: BL31, BL32, BL33, and BL34. BL32 is most often used specially for pain, numbness, and motor impairment of the lower extremities and is an ideal point for reducing pain during an IM injection [1].

Few studies have been conducted on the effects of acupressure on the pain of IM injections. In this regard, Suhrabi and Taghinejad, Masoudi Alavi, and Raddadi et al. [1,16,17] concluded that the use of acupressure reduces IM penicillin injection pain. These studies focused on penicillin injections, and additional studies must be conducted on injection of other painful drugs such as magnesium sulfate.

Repeated IM injections of magnesium sulfate, which is the first line of treatment for preeclampsia, are painful [18]. Considering the results of one study that showed 55% of women reported severe and very severe injection pain, IM injection of magnesium sulfate could be considered as one of the most painful injections [19]. To prevent tissue damage resulting from the large drug volume, its density, stimulant properties, and frequent injections, magnesium

sulfate is administered by the Z-track technique which is used for reducing drug leakage [20].

Since injections of magnesium sulfate are painful, the injections are repeated during the first 24 hours after childbirth, and research in this field is rare, the current study was conducted to investigate the effect of acupressure on pain associated with IM injections of magnesium sulfate in women with eclampsia and preeclampsia after cesarean section.

2. Materials and methods

2.1. Samples and settings

This three-stage, double-blind, one group quasi-experimental study was carried out on women with eclampsia and preeclampsia who delivered by cesarean section and had been admitted to three hospitals affiliated with the Shiraz University of Medical Sciences, Shiraz, southern Iran.

The study was conducted on 48 patients with preeclampsia and eclampsia who required magnesium sulfate injections. The inclusion criteria were 15–45 years of age, able to read and write, lack of known psychological condition such as depression, no pain in the lumbosacral region for any reason, including disk herniation, and no fractures in the thigh and hip. The exclusion criterion was receiving analgesics before injection (except diclofenac suppository).

Forty-eight eligible patients were studied through convenience sampling methods. The sample size was determined to be 48 participants, according to the study of Masoudi Alavi and Suhrabi and considering the indices $d = 6.1$, $S1 = S2 = 2$ (consistent with previous findings), $\beta = 0.02$, and $\alpha = 0.05$.

2.2. Intervention and data collection

Participants received magnesium sulfate intramuscularly every 4 hours in first 24 hours after cesarean section as prescribed by their obstetricians. Owing to the high volume of the medicine (10 ml), half of the dose was injected into each buttock [4]. Three consecutive injections were administered to each patient by researcher as three phases of the study. For the first injection (control phase), according to usual method, the patient lay on her left or right side (due to the cesarean section), and medicine was injected in to both buttocks using the Z-track technique. In this technique, the tissue at the injection site is pulled 2.5 cm to one side and is released after injection and needle removal for reducing drug leakage [21]. After 4 hours, for the second injection (sham control phase), the patient was asked to lie on her side again. This time, pressure was applied to sham control point, which was not a meridian point and causes no pain reduction. The location of the sham control point was identical in all patients, 5 cun¹ from the lateral side of the posterior superior iliac spine. One cun equals one thumb width at the base of the finger nail [22].

¹ Since everyone's body is of a different size and shape, the cun is used to measure and locate acupoints on anyone's body. "TCM Student: Cun Measurements". www.tcmstudent.com.

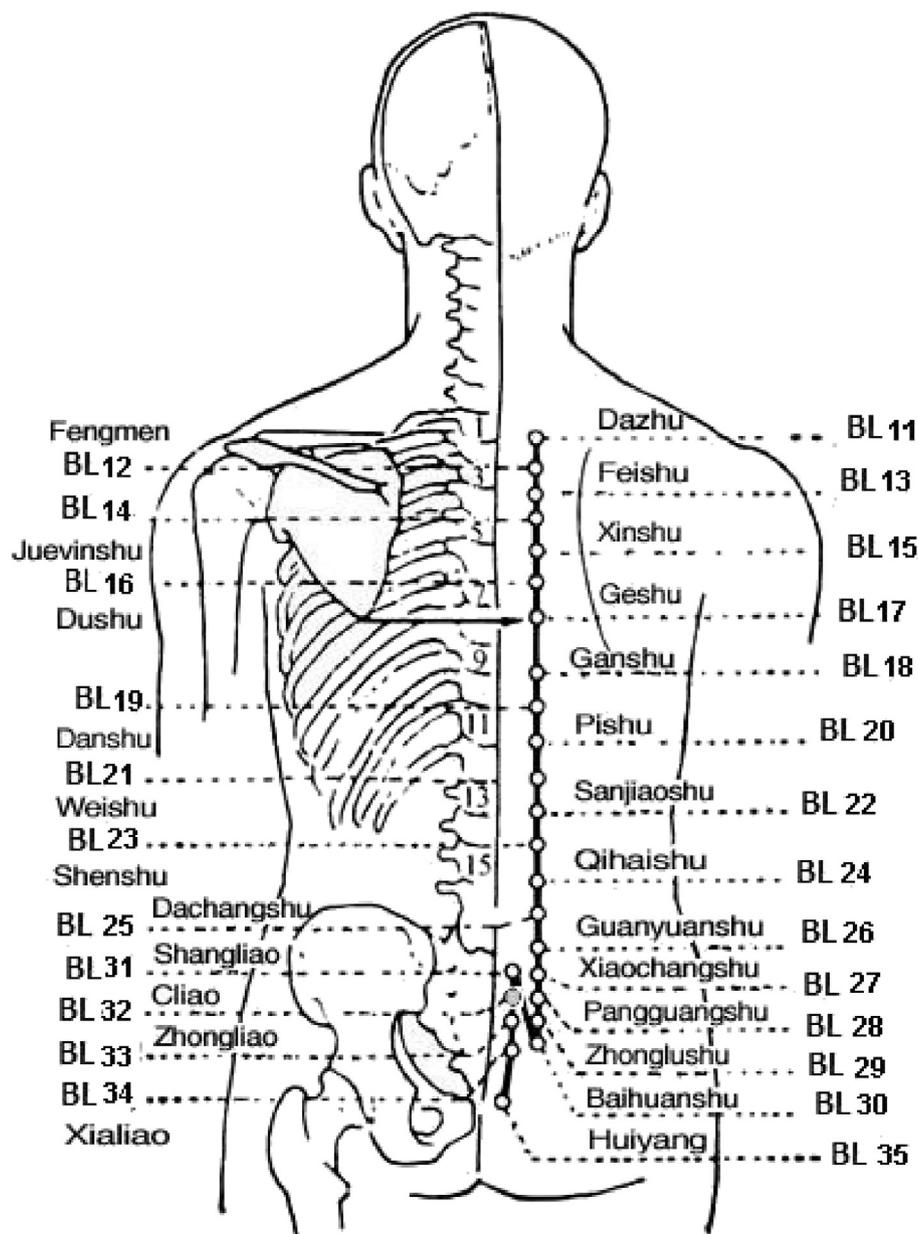


Figure 1 BL32 point. Available at: www.UB32.com.

Pressure was applied to the acupressure point BL32 and sham control point with the same pressure and technique and for 1 min directly, then three times sequentially by the researcher's thumb and with a pressure equal to 4.5 kg/cm². For assurance about applying proper pressure, the researcher spend five 2-hour sessions working with acupressure specialist using Saehan Hydraulic Pinch Gauge sh 5005, Saehan Com, South Korea device. Immediately after pressure was applied, 5 ml of the medicine was injected in to the same side by using the Z-track technique. Next, pressure was applied to the symmetrical point, which was located in the same place on the other side, by using the same technique and pressure, and then the remaining 5 ml of medicine was injected. Four hours later (intervention phase), the patients were asked to lie on their sides again. This time, BL32 located in the area of the sacrum

and inferior and medial to the posterior superior iliac spine [1], was determined (Fig. 1). The pressure level and technique was the same as for the second injection. Immediately after pressure was applied, 5 ml of medicine was injected at the same side with the Z-track technique. Next, the symmetrical point was located in the same place on the other side, and the remaining 5 ml of the medicine was injected after the pressure was applied.

The researcher administered all injections to the dorso-gluteal muscle at the upper outer quarter of the muscle using the Z-track technique. Based on the World Health Organization's protocol, the injection angle was determined as 90° [23]. A 5-ml syringe with a 22-gauge needle was used for all injections.

Before the intervention, patient's demographic information, including level of education, age, history of preeclampsia

Table 1 The demographic characteristics of patients.

Characteristics	Frequency	Percent
Education		
Below diploma	29	60.5
Diploma	9	18.8
University	10	20.8
Number of pregnancies		
1–2	33	68.7
3–4	9	18.7
5 and more	6	16.6
History of preeclampsia and eclampsia		
Positive	7	14.6
Negative	41	85.4
Age (years)	Mean	SD
	29.81	5.05

SD, standard deviation.

and eclampsia, number of pregnancies, and history of receiving magnesium sulfate, were recorded. Immediately after each injection, the co-investigator determined and recorded the pain intensity based on visual analog scale (VAS). The VAS was explained to the patients as a straight horizontal line of 100 mm, starting with no pain at the beginning end and the worst pain imaginable at the end (from 0 to 10) [24]. Patients marked the VAS line based on their pain intensity. They were unaware of which injection was performed with pressure on the real point and which was performed with pressure on the sham control point. The co-researcher was blinded to the interventions.

Data were analyzed with SPSS 21, using repeated measure analysis of variance for comparing mean of pain scores between three phases and Pearson's correlation and Spearman test for assessing the correlation between pain scores and subjects' demographic and clinical characteristics. Data analysis was performed by someone who was unaware of the intervention.

2.3. Ethical considerations

The current study was approved by the Research Ethics Committee of Shiraz University of Medical Sciences (No: IR.SUMS.REC.1395.122) and registered at the website of Iranian Registry of Clinical Trials' (reference number: IRCT201410278505N12). After receiving verbal explanations about the objective and methods, all participants signed written informed consents form. Also, the participants were assured that their information would remain confidential and, unwilling to participate, they could withdraw

from the study at any time and their lack of participation or withdrawal had no effect on their care and treatment.

3. Results

The average [standard deviation (SD)] age of participants was 29.81 (5.05) with a range of 17–39 years, and the mean (SD) number of pregnancies was 2 (1.47). Most of the participants (79.3%) held diploma or lower education levels, 14.6% ($n = 7$) of them had a history of preeclampsia and eclampsia, and none had received magnesium sulfate (Table 1).

Average (SD) pain intensity at the first (conventional), second (acupressure at sham control point), and third injection (pressure at the BL32) site was 7.22(2.08), 4.75(2.08), and 1.94 (1.27), respectively. Repeated measure analysis of variance showed a significant difference in pain intensity between the three injections ($p < 0.0001$).

Bonferroni *post hoc* test results showed that the pain intensity of injection with pressure at the point BL32, and sham control noneffective pressure points was significantly less than that in common method ($p < 0.0001$). Bonferroni *post hoc* test also showed that the mean pain intensity of injection with pressure at the BL32 point shows a significant decrease compared with injection with pressure at the sham control point ($p < 0.0001$) (Table 2).

Pearson's correlation test did not reveal a significant relationship between pain intensity and patients' age and number of pregnancies. Also Spearman test did not show relationship between level of education and history of preeclampsia and eclampsia with pain intensity ($p > 0.05$).

4. Discussion

The results of the study show that pressure on point BL32 before IM injection of magnesium sulfate effectively reduces the injection pain. The pain intensity score decreased significantly from the first injection (without any intervention) to the second injection (pressure at the sham control point) and the third injection (pressure at the point BL32). This result is consistent with previous studies in which acupressure reduced the injection pain from IM injection of penicillin. The results of study by Raddadi et al. showed that pressure applied to the BL32 point reduces the pain associated with this injection type significantly [17]. In their studies, Suhrabi and Taghinejad and Masoudi Alavi [1,16] reached the same conclusion as Raddadi et al. The biochemical mechanism of acupressure involves the stimulation of acupoints leading to complex neurohormonal responses. It involves counteraction along the

Table 2 Comparison of pain intensity mean (SD) in three IM injections.

Pain intensity in target group (Mean \pm SD)	Pain intensity in comparison groups (Mean \pm SD)	Mean difference	Standard deviation	P value
Usual method (7.22 \pm 2.08)	Sham control point (4.75 \pm 2.08)	2.46	0.339	<0.0001
Usual method (7.22 \pm 2.08)	BL32 point (1.94 \pm 1.27)	5.27	0.285	<0.0001
Sham control point (4.75 \pm 2.08)	BL32 point (1.94 \pm 1.27)	2.81	0.289	<0.0001

IM, intramuscular; SD, standard deviation.

hypothalamic–pituitary–adrenocortical axis, which leads to overproduction of cortisol and causes a relaxation response. It also modulates the physiological response by increasing endorphin and serotonin transmittance to the brain and specific organs through nerves and meridians. It helps in the physical performance by suppressing fatigue-inducing molecules in the blood [15,22].

In the current study, we used a sham control point, which had a positive effect on reducing injection pain. This effect appears to be rooted in the psychological effects of pressure. In a systematic review of 57 studies related to acupressure, He et al. found that in 37 cases, the effect of acupressure was greater than that of pressure applied to a sham control point. In the 20 other cases, the difference in the performance of the two points was not significant, and both points had identical effects on the outcome. [25]. Another systematic review of seven studies related to acupressure revealed that in five studies, the effect of acupressure on alleviating the pain associated with injection was greater than that of the sham procedure. The other two studies showed the same effect [26]. In the above-mentioned studies, as in the present work, pressure applied to the sham control point was effective in controlling symptoms, but its influence was less than that of pressure applied to the acupressure point.

In the present study, there were no significant correlations between pain intensity and the patients' demographic information, consistent with other similar studies [14,19]. However, the study by Raddadi et al. shows a significant relationship between education level and pain, i.e., with higher education level, the patient's reported pain intensity was decreased [17]. Because one of the tasks of nurses is to reduce the pain of invasive procedures such as injections, the results of the current study could be used to reduce the pain associated with IM injection by using acupressure. Considering the progressive public attention to complementary and integrative medicine and feasibility and safety of acupressure interventions, the results of this study is highly applicable.

Given that pain is a subjective feeling, we preferred not to use a control group, which could be a limitation. However, sampling from multiple hospitals increased the generalizability of this research. The small sample size is another limitation of this study. Therefore, we recommend that future studies be conducted with a larger sample size and a control group.

5. Conclusion

The results of the study revealed that although the pain associated with IM injection of magnesium sulfate could not be completely eliminated, it can be reduced significantly with acupressure at the BL32 point. Moreover, pressure on the sham control point could alleviate the patient's pain. Therefore, nurses are suggested to use acupressure as a nonaggressive, simple, and cost-effective method for reducing the pain associated with IM injection.

Disclosure statement

None declared.

Funding

This study was extracted from a research project financially supported by the Shiraz University of Medical Sciences, Shiraz, Iran (No: 11444).

Ethical approval

This study was approved by the Research Ethics Committee of Shiraz University of Medical Sciences (No: IR.SUMS.REC.1395.122).

Clinical trial registry

This study was registered at the website of Iranian Registry of Clinical Trials' (reference number: IRCT201410278505N12).

Acknowledgment

This manuscript was extracted from Setareh Nazarinbin's M.Sc. thesis on medical–surgical nursing (No: 11444). The authors would like to thank the Vice Chancellor for Research Affairs of the Shiraz University of Medical Sciences for their financial support.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jams.2018.07.002>.

References

- [1] Suhrabi Z, Taghinejad H. Effect of acupressure (UB32) on pain intensity in intramuscular injections. *Iran J Nurs Midwifery Res* 2014;19(1):24–7.
- [2] Yapucu Güneş Ü, Kara D, Arı S, Ceyhan O. Which site is more painful in intramuscular injections? The dorsogluteal site or the ventrogluteal site? A case study from Turkey. *Clin Nurs Stud* 2013;1(4):74–81.
- [3] Cupitt J, Kasipandian V. Pain and intramuscular injections. *Anaesthesia* 2004;59(1):93.
- [4] Cox D, Mohr DC, Epstein L. Treating self-injection phobia in patients prescribed injectable medications: a case example illustrating a six-session treatment model. *Cognit Behav Pract* 2004;11(3):278–83.
- [5] Kara D, YG Ü. The effect on pain of three different methods of intramuscular injection: a randomized controlled trial. *Int J Nurs Pract* 2014:1–8.
- [6] Ozedmir L, Pinarci E, Nisa A, Kay B, Akyol A. Effect of methylprednisolone injection speed on the perception of intramuscular injection pain. *J Pain Manag Nurs* 2013;14:3–10.
- [7] Kanika K, Rani K, PS. Effect of massage on pain perception after administration of intramuscular injection among adult patients. *Nurs Midwifery Res J* 2011;7(3):130–8.
- [8] Farhadi A, Esmailzadeh M. Effect of local cold on intensity of pain due to Penicillin Benzathin intramuscular injection. *Int J Med Med Sci* 2011;3(11):343–6.
- [9] Pouraboli B, Abazari F, Rostami M, Jahani Y. Comparison the effect of two methods of acupressure and massage with ice on

- Huko point on pain intensity during IV insertion in pediatrics with thalassemia. *J Pediatr Nurs* 2015;2(2):20–7.
- [10] Bergomi P, Scudeller L, Pintaldi S, Dal Molin A. Efficacy of non-pharmacological methods of pain management in children undergoing venipuncture in a pediatric outpatient clinic: a randomized controlled trial of audiovisual distraction and external cold and vibration. *J Pediatr Nurs* 2018. <https://doi.org/10.1016/j.pedn.2018.04.011>. S0882-5963(17)30536-5.
- [11] Chen HM, Wang HH, Chiu MH, Hu HM. Effects of acupressure on menstrual distress and low back pain in dysmenorrheic young adult women: an experimental study. *Pain Manag Nurs* 2015;16(3):188–97.
- [12] Cho W. Evidence-based non-pharmacological therapies for palliative cancer care. Hong Kong: springer; 2013.
- [13] Ansari-pour L, Morshed Behbahani B, Akbarzadeh M, Zare N. Comparison of the influence of acupressure and self-care behavior education on the severity of primary dysmenorrhea based on visual analogue scale among students. *Int J Med Res Health Sci* 2016;5(10):200–7.
- [14] Zotelli V, Grillo C, Sousa M. A case report on the effect of sham acupuncture. *J Acupunct Meridian Stud* 2016;9(5):275–8.
- [15] Miao J, Liu X, W C, Kong H, Xie W, Liu K. Effects of acupressure on chemotherapy-induced nausea and vomiting—a systematic review with meta-analyses and trial sequential analysis of randomized controlled trials. *Int J Nurs Stud* 2017;70:27–37.
- [16] Masoudi Alavi N. Effectiveness of acupressure to reduce pain in intramuscular injections. *Acute Pain* 2007;9(4):201–5.
- [17] Raddadi Y, Adib-Hajbaghery M, Ghadirzadeh Z, Kheirkhah D. Comparing the effects of acupressure at LI4 and BL32 points on intramuscular injection pain. *Eur J Integr Med* 2017;11:63–8.
- [18] Jabeen M, Yakoob MY, Imdad A, Bhutta ZA. Impact of interventions to prevent and manage preeclampsia and eclampsia on stillbirths. *BMC Publ Health* 2011;13(11 suppl 3):S6.
- [19] Vaziri F, Taheri M, Tavana Z. Lavender inhalation on intramuscular injection pain of magnesium sulfate in pre-eclamptic mothers: a randomized controlled trial. *Women's Health Bull* 2018;5(2), e62449.
- [20] Lowdermilk D, Perry S, Cashion M, Alden K. *Maternity and women's health care*. Elsevier; 2016.
- [21] Potter P, Perry A, Stockert P, Hall A. *Fundamentals of nursing*. Elsevier Health Sciences; 2016.
- [22] Mehta P, Dhapte V, Kadam S, Dhapte V. Contemporary acupressure therapy: adroit cure for painless recovery of therapeutic ailments. *J Tradit Compl Med* 2017;7(2):251–63.
- [23] Who. Reducing pain at the time of vaccination: WHO position paper, September 2015—recommendations. *Vaccine* 2016;34(32):3629–30.
- [24] Cillian AH, Mian S, Kendzerska T, French M. Measures of adult pain. *J Arthritis Care Res* 2011;63:240–52.
- [25] He W, Tong Y, Zhao Y, Zhang L, Ben H, Qin Q, et al. Review of controlled clinical trials on acupuncture versus sham acupuncture in Germany. *J Tradit Chin Med* 2013;33(3):403–7.
- [26] Jung A, Shin B-C, Lee MS, Sim H, Ernst E. Acupuncture for treating temporomandibular joint disorders: a systematic review and meta-analysis of randomized, sham-controlled trials. *J Dent* 2011;39(5):341–50.