ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

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The Effect of Local Cold Application and Autogenic Relaxation Exercise on Injection Pain in Intramuscular Injection

İntramüsküler Enjeksiyonda Lokal Soğuk Uygulama ve Otojen Gevşeme Egzersizinin Enjeksiyon Ağrısı Üzerine Etkisi

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ABSTRACT Objective: This study was conducted as an experimental trial to compare the effects of local cold application and autogenic relaxation exercise on pain in intramuscular (IM) injection application. **Material and Methods:** The research was carried out in Sivas Kılavuz Toki Family Health Center between 15 July and 15 November 2018. The population and sample of the study consisted of 150 individuals who received IM antibiotic (ceftriaxone) injection treatment between the specified dates and who met the inclusion criteria. The individuals in the sample group constituted both the control and intervention groups of the study. Approaches to reduce pain were performed by the investigator, and all injections were performed by the same clinical nurse in line with the injection administration protocol. "Personal Information Form" and "Visual Analogue Scale" were used for data collection. The data obtained from our study were evaluated in SPSS 22.0 for Windows program. All results were considered significant at p<0.05 and 95% confidence intervals. Friedman test was used to evaluate the data. **Results:** In the study, the mean pain score of the individuals after IM injection administered with the local cold application was 1.00 (0.00, 9.00) whereas their mean pain score following a standard injection administered based on the injection application protocol was 4.00 (1.00, 10.00). Also, individuals' mean post-IM injection pain score was determined to be 3.00 (0.00, 9.00). Accordingly, a statistically significant difference was found between these mean scores (p=0.001). **Conclusion:** In conclusion, the local cold application was found to be a more effective method in relieving IM injection-related pain compared to the autogenic relaxation exercises and the standard application administered in accordance with the injection application protocol. Besides, the autogenic relaxation exercise was determined to relieve IM injection pain considerably more than the standard method. The local cold application, alternatively autogenic relaxation exercises are recommended to relieve pain occurring due to IM injection.

Keywords: Autogenic relaxation exercise; local cold application; injection pain; intramuscular injection

ÖZET Amaç: Bu araştırma, intramüsküler (IM) enjeksiyon uygulamasında lokal soğuk uygulama ve otojen gevşeme egzersizinin ağrı üzerine olan etkilerinin karşılaştırılması amacıyla deneysel olarak yapılmıştır. **Gereç ve Yöntemler:** Araştırma, 15 Temmuz ve 15 Kasım 2018 tarihleri arasında Sivas Klavuz Toki Aile Sağlığı Merkezinde gerçekleştirilmiştir. Araştırmanın evrenini ve örneklemini belirtilen tarihler arasında IM antibiyotik (seftriakson) enjeksiyon tedavisi alan ve araştırmaya dâhil edilme kriterlerine uyan 150 birey oluşturmuştur. Örneklem grubunda yer alan bireyler araştırmanın hem kontrol hem de müdahale gruplarını oluşturmuştur. Ağrıyı azaltmaya yönelik yaklaşımlar araştırmacı tarafından, tüm enjeksiyonlar ise aynı klinik hemşiresi tarafından enjeksiyon uygulama protokolü doğrultusunda gerçekleştirilmiştir. Verilerin toplanmasında "Kişisel Bilgi Formu" ve "Vizüel Analog Skala" kullanılmıştır. Araştırmamızdan elde edilen veriler SPSS 22.0 for Windows programında değerlendirilmiştir. Tüm sonuçlar, p<0,05 ve %95 güven aralığında anlamlı kabul edilmiştir. Verilerin değerlendirilmesinde Friedman testi kullanılmıştır. **Bulgular:** Çalışmamızda, bireylerin lokal soğuk uygulama ile yapılan IM enjeksiyon sonrası ağrı puan ortalaması 1,00 (0,00, 9,00), enjeksiyon uygulama protokolü doğrultusunda uygulanan standart enjeksiyon sonrası ağrı puan ortalaması 4,00 (1,00, 10,00) ve otojen gevşeme egzersizi ardından yapılan IM enjeksiyon sonrası ağrı puan ortalaması 3,00 (0,00, 9,00) olarak bulunmuş ve bu puan ortalamaları arasında istatistiksel olarak anlamlı düzeyde fark saptanmıştır (p=0,001). **Sonuç:** Sonuç olarak, lokal soğuk uygulamanın IM enjeksiyon ağrısını azaltmada enjeksiyon uygulama protokolü doğrultusunda uygulanan standart uygulama ve otojen gevşeme egzersizine göre daha etkili bir yöntem olduğu, bununla birlikte otojen gevşeme egzersizinin de IM enjeksiyon ağrısını standart yönteme göre önemli düzeyde azalttığı saptanmıştır. Bu bağlamda IM enjeksiyona bağlı yaşanan ağrıyı azaltılmasında öncelikle lokal soğuk uygulama ve alternatif olarak otojen gevşeme egzersizinin uygulanması önerilmektedir.

Anahtar Kelimeler: Otojen gevşeme egzersizi; lokal soğuk uygulama; enjeksiyon ağrısı; intramüsküler enjeksiyon

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Pain is a complex and multidimensional condition associated with real or potential tissue damage, which gives unpleasant sensory and emotional experiences. It is also an individual, unique, and subjective experience that can be difficult to describe and define.[1] The prevention and relief of pain are essentials of human rights. Therefore, using the best approach in pain management is one of the leading responsibilities of the nurse.[2]

Intramuscular (IM) injections, which are thought of as an integral part of healthcare services, are widely used in the treatment processes, and they often cause pain as an invasive procedure. The chemical properties and volume of the injected drug, the injection technique, the position and anxiety of the individual, the dosing rate, the injection site, and the length of the needle are among factors that may affect pain. However, methods that reduce tissue sensitivity or provide relaxation may provide a painless IM injection experience for individuals. In recent studies, various methods used in IM injection have been shown to be effective in injection-related pain.[3-5] On the other hand, it is noteworthy that evidence related to current methods and approaches used in controlling IM-injection pain is still limited.[6]

Nurses are responsible for relieving individuals, reducing their anxiety, and increasing comfort with the methods and techniques they apply in care.[7,8] In this context, pharmacological and non-pharmacological methods are employed to reduce pain due to IM injection. In the literature, there are studies investigating the effectiveness of various methods for pain control in IM injections. These studies examined the effectiveness of various methods such as local cold application and manual pressure application. Shotblocker, music therapy Buzzy, Helfer skin tap internal rotation application, Z-track technique and autogenic relaxation exercise.[5,9-25] These methods have generally been shown to be effective; however, studies comparing the effectiveness of different methods with each other have remained limited.[26]

One of the methods used to reduce the pain of IM injection is to the injection area. It is a local cold application. Cold application has been used in the treatment of some diseases and ailments since ancient times for therapeutic purposes.[3] Cold application is effective in reducing pain in two ways. The first one is to eliminate or reduce pain by eliminating edema and muscle spasm. The second is effective in relieving pain by slowing or blocking the conduction of peripheral nerves.[3,9] Although there is limited research in this topic, the local cold application used for the prevention of pain in the IM injection application has been reported to reduce the injection pain.[9,10]

Relaxation exercise is another method used to relieve IM injection pain. This method contributes to improving the person's ability to cope with pain by reducing muscle tension and anxiety, distracts attention from pain, and increases endorphin release.[27] For individuals to use the relaxation technique, they need to be in a calm environment, sit or lie in a relaxed position without muscle tension, move away from all thoughts in their mind, and focus on a word, sound, or object as a mental tool.[3] Although the number of studies on the subject is small, the use of the muscle relaxation technique in IM injection has been determined to be effective in reducing injection pain.[28] Based on all these results, the study aimed to compare the effect of local cold application and autogenic relaxation exercise on pain in an IM injection.

MATERIAL AND METHODS

TYPE OF THE STUDY

This study is an experimental trial.

HYPOTHESES

H0: In IM injection, there is no difference between the effects of the standard method, local cold application, and autogenic relaxation exercise on injection pain.

H1: In IM injection, there is a difference between the effects of the standard method, local cold application, and autogenic relaxation exercise on injection pain.

H2: The local cold administration before IM injection reduces injection pain more compared to the standard method and autogenic relaxation exercise.

H3: The autogenic relaxation exercise that is done before IM injection reduces injection pain more

compared to the standard method and local cold administration.

THE STUDY SETTING

This study was carried out in Sivas Kılavuz Toki Family Health Center.

POPULATION AND SAMPLE OF THE STUDY

The study was conducted on a single pretest-posttest sample group. The individuals in the sample group made up both the control and intervention groups of the study. The number of samples was taken into consideration of the numerical values of the findings obtained from a previous study on this subject. The study, when α=0.05 β=0.10 1- β=0.90 in order to meet the parametric test assumptions, consisted of a total of 150 individuals who met the inclusion criteria, and it was carried out between July 15, 2018 and November 15, 2018.

INCLUSION CRITERIA

The study included individuals who;

1. Can speak and understand Turkish,

2. Volunteered to participate in the study and submitted informed consent,

3. Were aged between 18 and 65,

4. Had no disorders such as sensory motor deficit, diabetes, peripheral vascular disease, or neuropathy,

5. Received IM injection treatment twice a day or more,

6. Did not receive oral or parenteral analgesic treatment prior to injection,

7. Did not have a general Visual Analog Scale (VAS) score of greater than ‘‘0’’ prior to injection, that is, who did not have a general pain,

8. Were oriented to the place and the time, and

9. Did not have visual and hearing problems.

EXCLUSION CRITERIA

The study excluded individuals who;

1. Had a general VAS score of greater than ‘‘0’’ before the injection, that is, who experienced a general pain,

2. Failed to come to one or more of the three planned consecutive injections,

3. Refused the administration of the cold application and autogenic relaxation exercise applied within the scope of the project after accepting to participate in the study, and

4. Withdrew from the project after participating in the study voluntarily.

DATA COLLECTION FORMS

The study data were collected using a personal information form and the VAS.

THE PERSONAL INFORMATION FORM

This form was developed by the project director and researcher in light of the literature and consisted of 6 items collecting information about individuals’ age, gender, body mass index, diagnosis, and alcohol/substance use.[20,21]

THE VISUAL ANALOGUE SCALE

The scale was first used in the 1970s. It was defined by Selby et al. in 1980s to assess the quality of life in cancer patients.[29] VAS has been used in many studies evaluating different parameters after the 1990s, and it has recently been used to measure special conditions such as pain. The test has proven itself for a long time, and it is widely accepted and easily applicable in the world literature. It is a 10 cm-long scale, the left end of which is for “no pain” and the right end of which is for “severe pain”, on which the individual can mark the level of their pain VAS is used to convert some non-quantifiable values into numeric values.[30] Two end definitions of the parameter to be evaluated are written on both ends of a 100 mm line, and the individual is asked to indicate their pain status to the appropriate point on this line by drawing a line, marking a point, or marking a sign. The length of the distance from the point showing “no pain” to the point which the individual marked indicates the individual’s pain. The most important advantage of the scale is that it does not use a language and is easy to apply. Whether the alignment of the line on which the test is applied is vertical or horizontal, or its length does not affect the result of the measurement. VAS is reported to be more sensitive and reliable than

other one-dimensional scales for measuring pain severity.[31]

ADMINISTRATION OF THE DATA COLLECTION TOOLS

The individuals in the study were administered VAS before the injection. Patients with a VAS score greater than 0, that is, patients experiencing a general pain, were not included in the study because they would not be able to evaluate injection-related pain correctly. Before the drug was prepared, the physician's request was checked by the researcher. The patient was verbally informed and written informed consent was obtained. The patient was asked to lie down in the prone position. The skin surface in the ventrogluteal region was observed in terms of ecchymosis, scar, inflammation or edema. The presence of tenderness or stiffness was evaluated by palpation, paying attention to muscle integrity. In line with the training and support received from an expert on autogenic relaxation exercise, the researcher informed the individuals in the sample group about the content and application steps of the study for about 15 minutes. In three consecutive injections to be administered to the individuals, an IM injection protocol, which was established by the researchers based on the literature, was applied (Table 1). Patient diagnosis form was applied to the individuals and then in the study, all injections were performed by the same clinical nurse who was informed about the research, while the approaches for relieving pain were conducted by the researcher. A standard injection was performed without any non-pharmacology in the first injection. In the second injection, the local cold application was administered to the injection site before the IM injection, while in the third injection, the autogenic relaxation exercise was administered before the IM injection. After the first IM injection application, the individuals who were receiving ceftriaxone 2x1 treatment were administered VAS to their right ventrogluteal site, and the level and status of their pain were determined. Before the second IM injection to the left ventrogluteal site of the individual, the local cold application was performed to the injection site using a 13x13 cm cold pack for five minutes. After the IM injection, the individual was administered VAS, and the level and status of their pain were determined before the third injection to the right ventrogluteal site. The individual, by using autogenic relaxation techniques was applied for 5 minutes in line with the information provided by the researcher, the individual was made to breathe slowly, calmly and deeply, and then the muscles of hands, arms, face, neck, shoulders, and then the muscles of back, chest, abdomen, hips, legs, and feet were contracted and relaxed. The time between applications is 12 hours and after the application of the injection, the individual was administered VAS, and the level and status of their pain were determined.

ETHICAL CONSIDERATIONS

The study was carried out in accordance with the Declaration of Helsinki 2008 principles and at the outset, the approval of Cumhuriyet University Faculty of Medicine Clinical Research Ethics Committee (decision no: 2018-06/23 date: 26.06.2018) and the institutional permission were obtained. After the individuals included in the study were informed and their informed consent was obtained, the researcher started to collect the study data. The individuals were made sure that the decision on whether or not to participate in the study totally belonged to them, the data obtained from this study would be used only within the scope of the research, and that confidentiality would definitely be ensured (Figure 1).

STATISTICAL ANALYSIS

The study data were evaluated on SPSS 22.0 for Windows Statistical Software Package. Friedman test was employed to find where the difference comes from when a decision of significance was made. All results considered significant at $p<0.05$ and a confidence interval of 95%.

RESULTS

According to the findings of this study, which was carried out experimentally to compare the effect of local cold application and autogenic relaxation exercise on pain in IM injection application, the mean age of the individuals included in the age ranged from 18

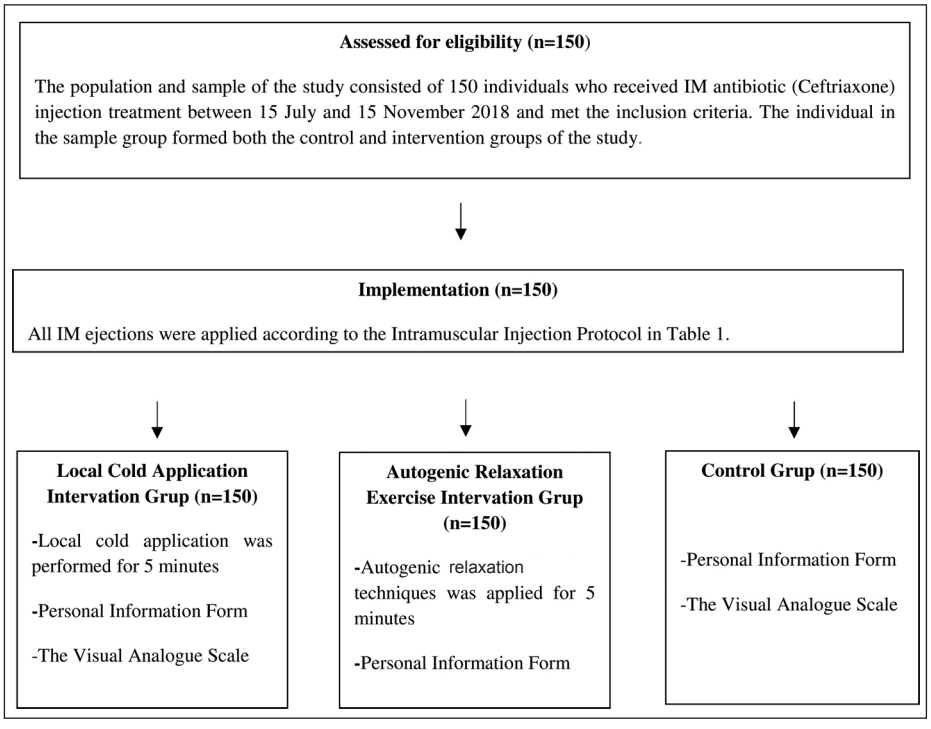

FIGURE 1: Flow diagram.

TABLE 1: Intramuscular injection protocol.[7,34,35]

Medication	Ceftriaxone (saline solution)
Injector volume	5 mL
Needle size	21
Needle tip replacement	Once every three injections
Air-lock technique	0.2 mL
Injection site	Right and left ventrogluteal area
Injection site cleaning agent	70% ethyl alcohol
Injection angle	90 degrees
Length of the injection administration	1 mL/10 sec
Removal of the needle	90 degrees
Post-injection application	Light pressure on injection site, no massage
Person recording the data	The researcher

to 65, with a median age of 43.00 (18.00, 65.00) and the sample consisted of 51.3% females and 48.7% males. The body mass index (BMI) rate of 62% of the individuals was between 18.50 and 24.99, and the BMI rate of 36.7% was greater than 25.00 (Table 2). The mean pain score obtained after the standard injection administrated under the injection application protocol was 4.00 (1.00, 10.00), the mean post-injection pain score in local cold application group was 1.00 (0.00, 9.00) and the mean post-injection pain score in the autogenic relaxation exercise group was 3.00 (0.00, 9.00) ($p<0.05$) (Figure 2, Table 3). Individuals' diagnosis, BMI, age, gender, and alcohol/substance use were found not to affect the mean pain score.

TABLE 2: Demographic characteristics of individuals (n=150).

Mean age (Minimum-Maximum)	43 (18-65)
	n (%)
Gender	
Female	77 (51.3)
Male	73 (48.7)
Body mass index (kg/m^2)	
<18.50	2 (1.3)
18.50-24.99	93 (62.0)
25.00-29.99	55 (36.7)
Diagnosis	
Urinary tract infection	111 (74.0)
Upper respiratory tract infection	39 (26.0)

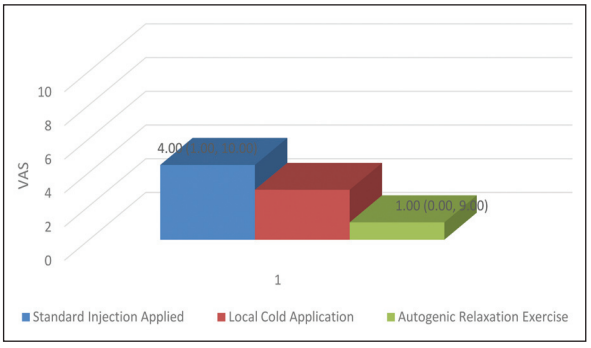

FIGURE 2: The effect of standard method, the local cold application, and the autogenic relaxation exercise on injection pain in individuals undergoing ıntramuscular injection.

TABLE 3: Comparison of the post-injection VAS pain scores of the groups (n=150).

Groups	(VAS) Median (Minimum-Maximum)	Test Value
Standard injection applied	4.00 (1.00-10.00)	χ^2: 594.299
Local cold application	1.00 (0.00-9.00)	p=0.001*
Autogenic relaxation exercise	3.00 (0.00-9.00)	

χ^2=Friedman test statistics; *p<0.05; VAS: Visual Analog Scale.

DISCUSSION

IM injections, which are considered as an integral part of health care services, are widely used in treatment processes, and as an invasive procedure, they often cause pain. Pain is one of the most common complications in IM injection practices, which is one of the responsibilities and basic skills of nurses.[16,22]

In our study, unlike many other studies, an injection protocol was prepared under the literature.[16,32] This protocol included parameters such as injection site, needle length, the length of the injection administration, needle tip replacement, and air-lock technology, and a standard was achieved for each IM injection application (Table 1).[7,33]

Pain is impacted by socio-cultural and cognitive characteristics such as the expression of pain, pain intensity, pain beliefs, and methods of coping with pain and emerges with different characteristics in different groups.[32] The study included individuals in the age ranged from 18 to 65, with an average age of 43.00 and the sample consisted of 51.3% females and 48.7% males. The BMI rate of 62% of the individuals was between 18.50 and 25.00, and the BMI rate of 36.7% was greater than 25.00. It was determined that there was no difference in terms of sociodemographic characteristics of the participants, thus showing homogeneous characteristics (Table 2). It has been found that BMI significantly affects the severity of pain during IM injection, and weak and normal weight individuals feel more severe pain than overweight individuals.[13] In this context, the individuals included in the sample of our study constituted both the intervention and control groups of the study. Therefore, unlike other studies in the literature, the effect of different complementary approaches on pain perception was evaluated on the same individuals in our study. Indeed, in contrast to our study, in other studies conducted on this subject, injection pain was evaluated and compared on different individuals in intervention and control groups.[10,34,35]

The examination of the distribution of the mean pain scores obtained after the implementation of different non-pharmacological method to relieve pain due to injection experienced by individuals in the scope of the study indicated that the pain level obtained after the injection with the local cold application was statistically significantly lower than the pain level observed after the injection with an autogenic relaxation exercise and standard injection (p=0.001, Table 3). However, the pain experienced in the injection after the application of autogenic relaxation exercise was found to be significantly lower than the pain experienced after the standard injection (Table 3). In light of the findings obtained in the study, the injection given after local cold application can be said to cause the least pain in the individuals.

When studies on pain control in IM injection using non-pharmacological methods and approaches were examined, there were no national and international studies that compared the pain experienced after IM injection given following the local cold application and autogenic relaxation exercise and the pain felt after a standard injection. However, there were studies in the literature separately examining the effectiveness of non-pharmacological method to pain

control in IM injection.[9,11] There is no information on this subject in the literature and it is recommended to be evaluated in future studies. In this context, the local cold application to the site before IM injection was reported to significantly relieve the injection pain experienced. Moreover, there was no study in the literature investigating the effectiveness of autogenic relaxation exercise on IM injection pain.

The use of evidence-based approaches to highlight the concept of quality in the provision of nursing care is important. In this context, our study is thought to contribute to the provision of evidence within the scope of the use of non-pharmacological method to reduce pain in IM injections to the control of IM injection-related pain.

CONCLUSION

As a result, it was determined that local cold application and autogenic relaxation exercise are effective methods in reducing pain during IM injection. It may be suggested to compare the results obtained with the results of research conducted by other non-pharmacological methods and to conduct studies with different sample groups, different amounts and different drugs. In line with these results, it is recommended that nurses should more frequently use non-pharmacological methods with proven efficacy to relieve pain in IM injection, they should follow the developments in this field, and they should put them into practice.

STUDY LIMITATIONS AND STRENGTHS

The limitations of the study are the collection of research data in a single center, the participation of a limited number of people, the fact that the pain is a personalized experience, and it can be affected by various individual factors.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

All authors contributed equally while this study preparing.

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