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**ORIGINAL ARTICLE /** ARAŞTIRMA YAZISI

Fundamentals of Nursing/Hemşireliğin Temelleri

# Effect of Cold Needle on Injection Complications

**Azzet Yüksel[1], Huriye Arslaner[2], Funda Büyükyılmaz[3]**

[1] Kocaeli Health and Technology University, Kocaeli, Türkiye

[2] Graduate Education Institute PhD Program of Fundamentals of Nursing, Istanbul University-Cerrahpaşa, Istanbul, Türkiye

[3] Istanbul University-Cerrahpaşa, Florence Nightingale Faculty of Nursing, Department of Fundamentals of Nursing, Istanbul, Türkiye

Azzet YÜKSEL
0000-0003-1363-972X

Huriye ARSLANER
0000-0003-2692-1273

Funda BÜYÜKYILMAZ
0000-0002-7958-4031

**Correspondence:** Azzet Yüksel
Kocaeli Health and Technology University, Kocaeli, Türkiye
**Phone:** +90 554 997 38 94
**E-mail:** azzet.yuksel@kocaelisaglik.edu.tr

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**ABSTRACT**

**Propose:** This study aimed to evaluate the effects of cold needle (0–2°C) application on pain intensity, ecchymosis rate, and patient comfort during subcutaneous (SC) insulin injections. The hypotheses; When administering insulin via the SC route, a cold needle temperature reduces pain intensity and incidence of ecchymosis. Using a cold needle during subcutaneous insulin injection increases comfort levels.

**Methods:** A semi-experimental two-group design was used. Eighty hospitalized patients receiving SC insulin (Intervention=40, control=40) were included in the study. In the Intervention group, insulin syringes were stored at 0–2°C for at least 2 hours prior to use; in the control group, syringes at room temperature were used. Data were collected using the Patient Information Form, SC Route Injection Follow-up Chart, Visual Analogue Scale, and Opsite-Flexigrid Measurement Tool; observations were performed by two different observers.

**Results:** The cold needle application significantly reduced pain intensity immediately after injection and at 24 and 48 hours ($p<0.05$). However, no significant differences were observed between the groups in terms of ecchymosis rates and comfort levels.

**Conclusion:** Cold needles (0–2°C) are an effective and feasible method for pain management in SC insulin injections. Further studies are recommended to clarify their effects on ecchymosis and comfort, systematically examining injection duration and comfort parameters in the short, medium, and long term.

**Keyword:** Cold needle, subcutaneous injection, pain, ecchymosis, comfort

**ÖZET**

**Amaç:** Bu çalışmada, soğuk iğne (0–2°C) uygulamasının subkütan (SC) insülin enjeksiyonları sırasında ağrı şiddeti, ekimoz oranı ve hasta konforu üzerindeki etkilerini değerlendirmek amaçladı. Hipotezler; SC insülin enjeksiyonunda soğuk iğne kullanılması ağrı şiddetini ve ekimoz görülme oranını azaltır. Subkütan insülin enjeksiyonu sırasında soğuk iğne kullanımı konfor seviyesini artırır.

**Yöntemler:** Yarı deneysel iki grup tasarımı kullanıldı. SC insülin alan seksen hastaya (Müdahale=40, kontrol=40) çalışma dahil edildi. Müdahale grubunda, insülin enjektörleri kullanılmadan en az 2 saat önce 0–2°C'de saklandı; kontrol grubunda ise oda sıcaklığındaki enjektörler kullanıldı. Veriler, Hasta Bilgi Formu, SC Yolu Enjeksiyon Takip Çizelgesi, Görsel Analog Skala ve Opsite-Flexigrid Ölçüm Aracı kullanılarak toplandı. Değerlendirmeler iki farklı gözlemci tarafından birbirinden bağımsız gerçekleştirildi.

**Bulgular:** Soğuk iğne uygulaması, enjeksiyondan hemen sonra ve 24 ile 48 saat sonra ağrı şiddetini önemli ölçüde azaltmıştır ($p<0.05$). Ancak, gruplar arasında ekimoz oranları ve konfor seviyeleri açısından istatistiksel olarak anlamlı farklılıklar gözlemlenmedi.

**Sonuç:** Soğuk iğneler (0–2°C), SC insülin enjeksiyonlarında ağrı yönetimi için etkili ve uygulanabilir bir yöntemdir. Ekimoz ve konfor üzerindeki etkilerini netleştirmek için daha fazla çalışma önerilmektedir. Enjeksiyon süresi ve konfor parametrelerini kısa, orta ve uzun vadede sistematik olarak incelemek önemlidir.

**Anahtar Kelimeler:** Soğuk iğne, subkütan enjeksiyon, ağrı, ekimoz, konfor

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Diabetes mellitus may occur when there is insufficient secretion or deficiency of the insulin hormone (1). In individuals diagnosed with Diabetes Mellitus, oral anti-diabetic drugs are used or insulin is administered during the pharmacological treatment process to regulate glucose levels (1,2). Insulin administered by subcutaneous (SC) injection can be administered to the outer-lateral aspect of the upper arm, the gluteal region, the abdominal region, and the anterior aspect of the thigh (2).

Complications such as pain and ecchymosis are frequently observed after injections administered via the SC route4. Pain is a subjective experience arising from tissue trauma caused by the needle (4,5). Pain occurs during and after the injection and affects patients' compliance with treatment, limb use, performance of activities of daily living, and comfort level (6,7). Ecchymosis is a complication associated with bleeding disorders and tissue trauma. Ecchymosis causes increased pain intensity in patients and negatively affects body image and drug absorption (8,9).

Local ice application and dry cold methods are used to prevent these (10,11,12). The literature indicates that the use of cold needles (0-2 degrees) for intramuscular injections reduces the intensity of pain experienced by patients (10,11,12). When examining current national and international studies aimed at minimizing complications following subcutaneous injection: In a study by Şendir et al. (13), it was observed that administering anticoagulant injections via the SC route in the abdominal region for 30 seconds, along with applying ice locally to the area for 5 minutes before and after the injection, was effective in preventing pain intensity and ecchymosis formation. In another study, Cevheroğlu and Büyükyılmaz (14) found that applying dry cold (ice pack) locally for 5 minutes after an SC injection into the abdominal region was effective in reducing the incidence and size of ecchymosis. In the literature, there are limited studies investigating the effect of cold needle application on complications associated with SC injection procedures (15). In this study conducted by Kaplan et al. (15), the application of cold needles (0-2 degrees) during SC anticoagulant injections administered on the outer surface of the upper arm was found to have a positive effect on the pain level immediately after injection, and also significantly reduced the development of ecchymosis at 24, 48, and 72 hours post-injection. However, due to local complications arising from SC injections, pain can be felt at the 24th, 48th, and 72nd hours after the injection (27). Therefore, it is important to determine the long-term impact of SC injection applications on pain severity.

Studies examining the short- and long-term effects of cold needle application on pain intensity and comfort levels during subcutaneous (SC) injections are quite limited in the literature. Furthermore, there are no studies investigating the effect of cold needle application on complication management in insulin injections. This research makes an important contribution to the literature by Interventionly investigating the effects of needle temperature (0–2°C) on pain intensity, ecchymosis rate, and comfort level in SC insulin injections. Furthermore, the study provides an opportunity to compare the effects of cold needle use on complications in patients receiving anticoagulant therapy with existing findings. Thus, it offers unique and up-to-date information in terms of both clinical practice and gaps in the literature.

*The hypotheses of the study are as follows:*

**$H1_1$.** When administering insulin via the SC route, a cold needle temperature reduces pain intensity.

**$H1_2$.** When administering insulin via the SC route, a cold needle temperature reduces the incidence of ecchymosis.

**$H1_3$.** Using a cold needle during subcutaneous insulin injection increases comfort levels.

## Material and Methods

The study was conducted using a semi-Intervention design to determine the effect of needle temperature on pain intensity, ecchymosis rate, and comfort level in subcutaneous (SC) insulin injections.

### *Study Sample*

The study population consisted of patients receiving SC insulin injections who were hospitalized at an inpatient treatment facility affiliated with the Istanbul Provincial Health Directorate. The sample size was determined by performing a power analysis on the population. A power analysis was performed to determine the adequate sample size for the study. The power analysis was performed using the G*Power 3.1.9.4 software package (16). Previous studies on the subject were referenced to calculate the effect size17,18. Accordingly, for the two-tailed hypothesis, with a margin of error (Alpha) = 0.05, effect size (d) = 0.70, and Power = 0.80, it was calculated

that the minimum sample size required for the study was 68 people, with 34 people in each group. However, considering the losses experienced during the research process, the study was conducted with a total of 80 participants, 40 in each group.

### *Inclusion Criteria*

(1) The patient must be 18 years of age or older, (2) The patient must be scheduled to receive insulin injections via the SC route in the clinic where they are admitted, (3) The absence of any visual, verbal, auditory, or perceptual health problems as defined by the physician, (4) A platelet count of 100,000/$mm^3$ or above, (5) The absence of any findings such as scarring, incisions, ecchymosis, or haematoma on the skin in the area where the injection will be administered.

### *Exclusion Criteria*

(1) Presence of verbal or auditory problems, (2) Use of anticoagulant medication via the SC route.

### *Data Collection Tools*

*Data Collection Tools:* The following were used to collect data: 'Patient Information Form', 'SC Route Injection Follow-up Chart', 'Visual Analogue Scale' and 'Opsite-Flexigrid Measurement Tool'.

*Patient Information Form:* This form consists of a total of 9 questions regarding the patient's age, gender, height, weight, educational status, smoking status, presence of chronic disease, medications used, and bleeding and clotting times.

*SC Injection Follow-up Chart:* Prepared by the researcher, this chart was used to track the formation and size of ecchymosis at 24, 48, and 72 hours after SC insulin injection. The formation and size of ecchymosis were determined by the researcher and an independent observer, a specialist nurse.

*Visual Analogue Scale (VAS):* Developed by Price et al. (19), this scale is a unidimensional measure. It was used to determine the intensity of pain and level of comfort during and after the SC insulin injection procedure. The VAS is a 10 cm ruler; one end reflects the absence of pain, while the other end reflects the most severe pain possible. It determines the intensity of pain with one end representing 'no pain' and the other end representing 'the most severe pain possible'. When used to assess patient comfort, the VAS indicates that 0 points represent no comfort and 10 points represent the highest level of comfort. The VAS was used to measure pain intensity immediately after SC injection and pain intensity and comfort levels at 24, 48, and 72 hours after SC injection.

*Opsite-Flexigrid Measurement Tool:* This was used to determine the size of the ecchymosis formed after SC insulin injection.

### *Data Collection*

After obtaining ethical committee and institutional approval, data was collected from all patients who met the inclusion criteria and agreed to participate in the study, with informed consent obtained. Research data was collected between December 2024 and May 2025.

To standardize the medical conditions of patients in the Intervention and control groups, data were collected from the same clinic (cardiology). First, data from the control group was collected. Then, data from the intervention group was collected. In subcutaneous injection application guidelines, it is stated that one area should be used each week to prevent the development of complications (20,21,22). In this context, if the time the researcher applies the injection coincides with the rotation of the abdominal area, the area is divided into four sections; if it coincides with other injection sites, it is divided into two sections for the injection. Insulin injections via the SC route in the Intervention and control groups was administered by the same nurse in accordance with current literature (20,21,22).

The nurse administering the SC insulin injection (with 20 years of clinical experience, specializing in nursing fundamentals) washed her hands and put on gloves before preparing the medication, checked the patient's identity and the amount of insulin to be administered from the patient's file.

Subsequently, the insulin dose to be administered to the patient was drawn into the syringe, the air was removed from the syringe, and the injection site was wiped with a single-use 70% alcohol swab in a circular motion from the center outwards and allowed to dry before administration (20,21,22). During the injection, the skin was pinched (using the thumb and index/middle finger) at a 90-degree angle to the site, and the medication was injected without aspiration. After injecting the medication, the syringe was withdrawn from under the skin after waiting 10 seconds, and the skin fold was released. After withdrawing the

syringe, very light pressure was applied to the area with dry cotton for 1-2 minutes. No massage was performed, and after the application, the syringe needle was discarded in the medical waste bin without replacing the cap. The procedure performed after the insulin injection was recorded in the patient's file, and the patient was observed for the effects and side effects of the medication (20,21,22). Patient information and the area where the injection was administered were recorded for evaluation during the follow-ups.

The insulin needle (13 mm long) to be used in the Intervention group was stored at 0-2 degrees (in the deli compartment of the refrigerator) for 2 hours before injection. In the control group, the insulin needle (13 mm long) to be used was stored at room temperature.

For all SC insulin injections, ecchymosis size measurements, pain and comfort assessments were performed by the researcher administering the injection and an independent observer (a specialist nurse with 6 years of clinical experience). In this study, due to the nurse administering the injection being aware of the temperature of the syringes, patient blinding was implemented to minimize potential placebo effects. In this context, patients were not informed about whether the syringes used during the injection were cold or at room temperature. Indeed, pain and comfort levels were determined based on the self-reports of the patients. Therefore, patient blinding is crucial for the reliability of the data. In the literature, ecchymosis smaller than 2 mm are categorized as small diameter, ecchymosis between 2 mm and 10 mm are categorized as medium diameter, and ecchymosis larger than 10 mm are categorized as large diameter (4,13). In this study, due to their small numbers, the data were analyzed based on the presence or absence of ecchymosis. Pain immediately after injection and pain intensity and comfort level at 24, 48, and 72 hours after injection were determined based on the patient's self-reports. The size of the ecchymosis formed at 24, 48, and 72 hours after the injection was assessed independently by the researcher who administered the injection and an independent observer.

### *Ethical Consideration*

To conduct the study, an application was made to the non-interventional clinical research ethics committee of Kartal Koşuyolu High Specialization Training and Research Hospital, and ethical committee approval (No: 2023117/731) and institutional permission (No: E-15916306-604.01-235409576) and informed consent was obtained from patients meeting the inclusion criteria via a volunteer consent form.

### *Statistical Analysis*

Data were analysis using the SPSS programme. Normality was assessed using the Kolmogorov-Smirnov test and by examining skewness and kurtosis values. Homogeneity between groups was assessed using the chi-square test, while differences between two independent groups were analysis using the t-test or Mann-Whitney U test, depending on the distribution. Intra-group measurements were compared using repeated measures ANOVA or the Friedman test, depending on data normality.

## Results

Within the study, it was determined that 53.80% of the patients were aged 65 and under, 56.3% were female, 66.3% were primary school graduates, 46.3% had a body mass index greater than 30 kg/m2, . 62.5% did not smoke. Accordingly, it was observed that the individual and disease characteristics of the Intervention and control groups were similar, with no difference between them ($p>0.05$) (Table 1)

SC insulin injection immediately after administration and 24 hours post-injection showed a highly significant difference in pain intensity between groups ($p\leq0.001$; Table 2). According to effect size calculations, the difference in pain intensity measured immediately after injection was large ($r=0.50$), while the difference in pain intensity measured 24 hours after injection was moderate ($r=0.36$). This result indicates that participants in the Intervention group experienced lower levels of pain (0.6 unit difference) immediately after the injection and 24 hours after the injection. A significant difference was also found between the Intervention group and the control group in the pain measurement 48 hours after the injection ($p<0.05$). According to effect size calculations, this effect was determined to be moderate ($r=0.23$). This is due to the fact that the pain intensity 48 hours after the injection in the Intervention group was statistically significantly lower than in the control group. No significant difference was observed between the groups in the assessment performed 72 hours after the injection ($p>0.05$) (Table 2; Figure 1).

**Table 1.** Individual and Disease- and Treatment-Related Characteristics

| Individual and Disease- and Treatment-Related Characteristics | | Intervention group (n=40) | | Control Group(n=40) | | Total | | $x^2$ | p |
|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | | |
| **Age** | Age <65 | 19 | 47.5 | **24** | **60** | **43** | **53.8** | 1,257 | 0,370 |
| | Age>65 | **21** | **52.5** | 16 | 40 | 37 | 46.3 | | |
| **Gender** | Female | **23** | **57.5** | **22** | **55.0** | **45** | **56.3** | 0,051 | 1,000 |
| | Male | 17 | 42.5 | 18 | 45.0 | 35 | 43.8 | | |
| **BMI** | ≤ 24.99 kg / m² | 4 | 10,0 | 11 | 27,5 | 15 | 18,8 | 4,085 | 0,121 |
| | 25 – 29.9 kg / m² | 15 | 37,5 | 13 | 32,5 | 28 | 35,0 | | |
| | ≥ 30 kg / m² | **21** | **52,5** | **16** | **40,0** | **37** | **46,3** | | |
| **Education level** | Elementary school | **20** | **50,0** | **17** | **42,5** | **37** | **46,3** | 2,334 | 0.375 |
| | Middle school | 15 | 37,5 | 15 | 37,5 | 30 | 37,5 | | |
| | High school | 5 | 12,5 | 6 | 15,0 | 11 | 13,8 | | |
| | University | 0 | 0 | 2 | 5,0 | 2 | 2,5 | | |
| **Smoking Condition** | No | **27** | **67,5** | **23** | **57,5** | **50** | **62,5** | 0.853 | 0.489 |
| | Yes | 13 | 32,5 | 17 | 42,5 | 30 | 37,5 | | |
| | | **X± SD** | | **X± SD** | | **X± SD** | | **t** | **p** |
| **Age** | | 64.47±10.12 | | 60.52±13.34 | | 62.50±11.93 | | **1.491** | **0.140** |

*x2: Chi-Square Test, t: independent sample test, X: mean, SD.: standart deviation*

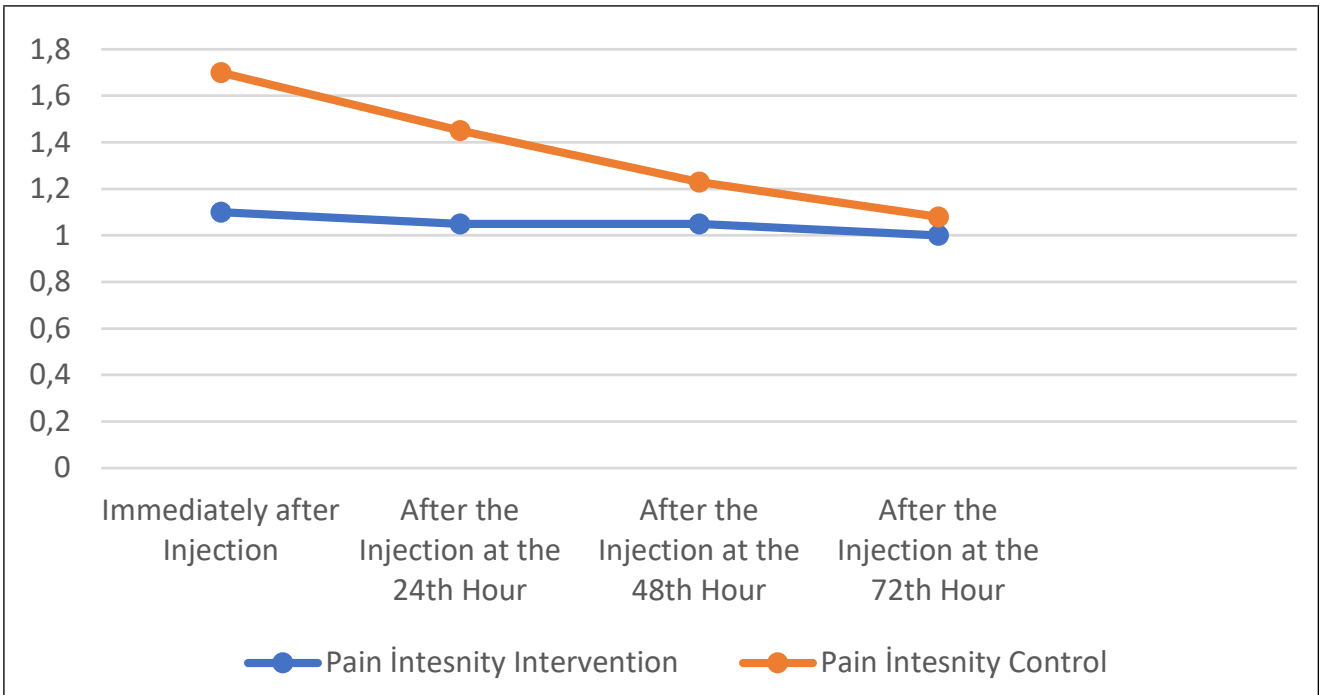



**Figure 1.** Comparison of Pain Intensity in the Intervention and Control Groups

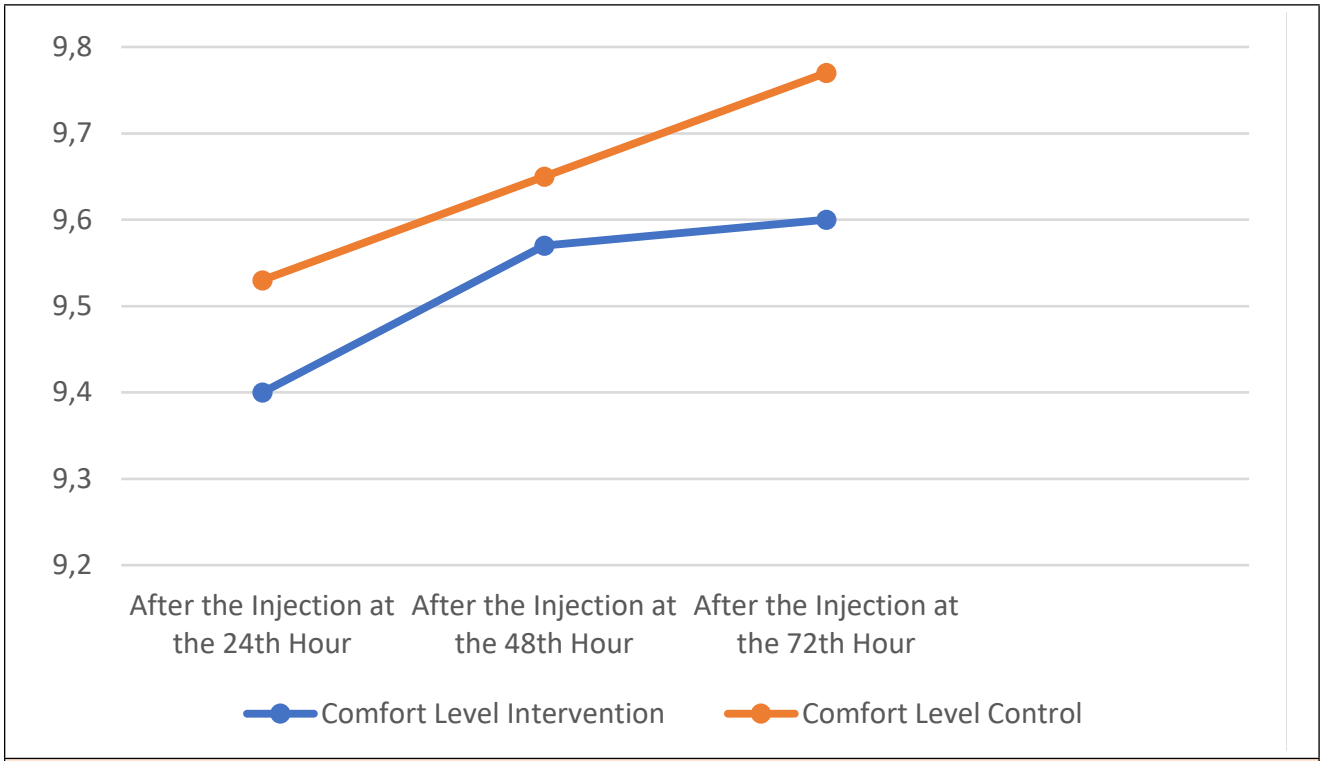



**Figure 2.** Comparison of Comfort Levels in the Intervention and Control Groups

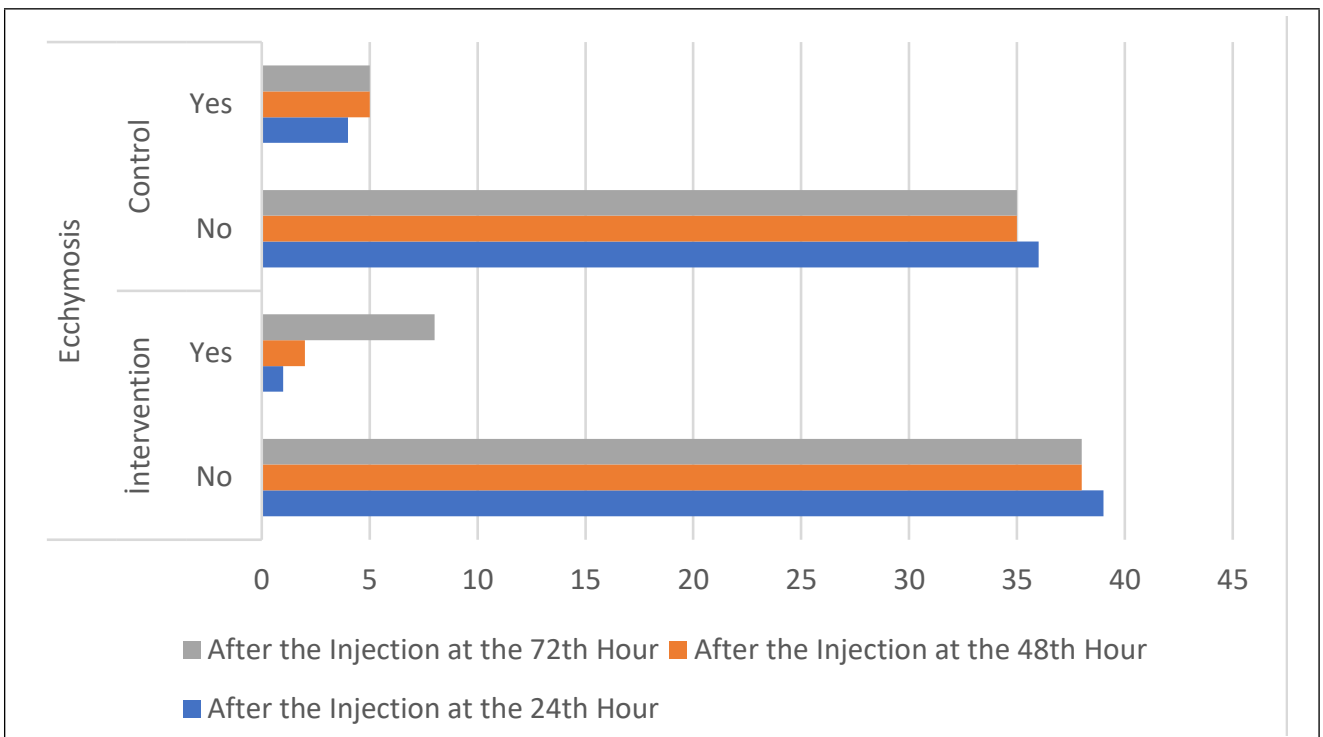



**Figure 3.** Comparing the Presence of Bruising in the Intervention and Control Groups

| **Table 2.** Comparison of Pain Intensity in the Intervention and Control Groups | | | | | |
|---|---|---|---|---|---|
| **Pain Intensity** | | **Intervention** | **Control** | **Statistical Analysis** | **r** |
| **Immediately after Injection** | Mean ± SD | 1,10 ± 0,37 | 1.70 ± 0.72 | U = 422.00 | **0.50** |
| | Median ( Min - Max ) | 1 ( 1 – 3 ) | 1 ( 1 - 3 ) | p = **0.000**** | |
| **After the Injection at the 24th Hour** | Mean ± SD | 1.05 ± 0.22 | 1.45 ± 0.71 | U = 575,00 | **0.36** |
| | Median ( Min - Max ) | 1 ( 1 – 2 ) | 1 ( 1 - 3 ) | P=0**.001**** | |
| **After the Injection at the 48th Hour** | Mean ± SD | 1.05 ± 0.22 | 1.23 ± 0.48 | U = 679,00 | **0.23** |
| | Median ( Min - Max ) | 1 ( 1 - 2 ) | 1 ( 1 - 3 ) | p = **0.042*** | |
| **After the Injection at the 72th Hour** | Mean ± SD | 1.00 ± 0.00 | 1.08 ± 0.35 | U = 760.00 | 0.16 |
| | Median ( Min - Max ) | 1 ( 1 - 1 ) | 1 ( 1 - 3 ) | p = 0,155 | |
| *a : Mann – Withney U Test, SD : Standart Deviation, *p≤0,05, **p≤0,001* | | | | | |

| **Table 3.** Comparison of Comfort Levels in the Intervention and Control Groups | | | | |
|---|---|---|---|---|
| **Comfort Level** | | **Intervention** | **Control** | **Statistical Analysis** |
| **After the Injection at the 24th Hour** | Mean ± SD | 9,40 ± 1.15 | 9.53 ± 0.67 | U = 758,50 |
| | Median ( Min - Max ) | 10 ( 6 - 10 ) | 10 ( 8 - 10) | p = 0,630[a] |
| **After the Injection at the 48th Hour** | Mean ± SD | 9,57 ± 1.01 | 9.65 ± 0.70 | U = 788,00 |
| | Median ( Min - Max ) | 10 ( 5 - 10 ) | 10 ( 7 - 10) | p = 0,877[a] |
| **After the Injection at the 72th Hour** | Mean ± SD | 9.60 ± 0,98 | 9.77 ± 0.53 | U = 756,50 |
| | Median ( Min - Max ) | 10 ( 5 - 10 ) | 10 ( 8 - 10) | p = 0,548[a] |
| *a : Mann – Withney U Test, p > 0.05, SD : Standart Deviation* | | | | |

| **Table 4.** Comparing the Presence of Ecchymosis in the Intervention and Control Groups | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Measurement Time** | **Ecchymosis** | | | | $X^2$ | **P** |
| | | **No** | | **Yes** | | | |
| | | **n** | **%** | **n** | **%** | | |
| Intervention | After the Injection at the 24th Hour | 39 | 97,5 | 1 | 2,5 | 1.920 | 0,359 |
| Control | | 36 | 90,0 | 4 | 10,0 | | |
| Intervention | After the Injection at the 48th Hour | 38 | 95,0 | 2 | 5,0 | 1.409 | 0,432 |
| Control | | 35 | 87,5 | 5 | 12,5 | | |
| Intervention | After the Injection at the 72th Hour | 38 | 95,0 | 2 | 5,0 | 1.409 | 0,216 |
| Control | | 35 | 87,5 | 5 | 12,5 | | |
| *x2: Chi-Square Test,* | | | | | | | |

The comfort levels of patients at 24, 48, and 72 hours post-injection were determined based on their verbal reports. The analysis revealed that the comfort levels of the patients at 24, 48, and 72 hours were similar (quite comfortable) and that there was no significant difference between the Intervention and control groups (p>0.05; Table 3).

There was no significant difference between the intervention and control groups in the incidence of ecchymosis at 24, 48, and 72 hours after subcutaneous insulin injection (p>0.05; Table 4).

## Discussion

This research used insulin for SC injections administered with cold needles and examined the long-term effects of cold needles on pain and comfort. Accordingly, the study aimed to investigate the effect of needle temperature (0-2 degrees) on pain intensity, ecchymosis rate, and comfort in the short and long term during SC insulin injections.

*Pain intensity and comfort level*

This study found that the use of a cold needle (0-2 degrees) for SC insulin injection reduced the pain intensity experienced at 0, 24, and 48 hours after injection (Table 2, Figure 1). The significant effect observed immediately after injection and the moderate effect observed at 24 and 48 hours after injection suggest that the use of cold needles (0-2 degrees) in SC insulin injections is a useful intervention for experiencing pain, which is a subjective experience, at a lower intensity. Indeed, it is known that cold application, a non-pharmacological method, positively affects pain by increasing endorphin levels and slowing the transmission of pain signals (26). A review of the literature reveals that intramuscular injections administered using cold needles (0-2 degrees) result in lower pain intensity experienced by patients (10,17,11,12). In studies conducted by Kaplan and colleagues15 on patients receiving SC anticoagulant injections, the use of cold needles (0-2 degrees) was found to significantly reduce pain intensity immediately after injection. However, no studies were found investigating the effect of SC injection using a cold needle on pain intensity at 24, 48, and 72 hours. In line with the literature, this study found that administering insulin via SC injection using a cold needle (0-2 degrees) reduced the intensity of pain experienced at 0, 24, and 48 hours after injection. In this study, the observed 0.6-unit difference between the intervention and control groups during insulin injections is considered clinically significant, given the continuity of SC insulin injections. In this context, it may enhance patient comfort over time and positively influence adherence to treatment. To support the findings of this study, future research should standardize the injection duration, which affects pain development, and examine the long-term effects of cold needle application on pain intensity.

In this study, the use of cold needles (0-2 degrees) in SC insulin injections had no significant effect on comfort levels at 24, 48, and 72 hours after injection. This finding indicates that the use of cold needles in SC injections does not have a positive effect on patient comfort. No studies were found in the literature investigating the effect of cold needles on comfort in SC injection applications. However, Ordu et.al., (23). found that the use of cold needles (0-2 degrees) in intramuscular injections increased the satisfaction level of patients23. In another study by İnangil and Şendir (24), it was determined that the use of cold needles in SC anticoagulant injections increased satisfaction levels in individuals. It is known that low pain intensity experienced by patients increases comfort (24). This study suggests that the lack of effect of cold needle use in the medium and long term after injection is due to the cold needle (0-2 degrees) having a lower effect on pain intensity in the medium and long term. This situation suggests that cold needles (0-2 degrees) may have a short-term effect on comfort in patients, and in this context, it is recommended that the short-term effects of cold needle application on comfort be investigated.

*Ecchymosis incidence rate*

This study found that the use of cold needles in SC injections had no effect on the incidence of ecchymosis. This finding indicates that the use of cold needles in SC insulin injections has no positive effect on ecchymosis, a complication that occurs after injection. The national and international literature indicates that cold application to the injection site has a positive effect on ecchymosis (13,14,24). A study was found in the literature investigating the effect of cold needles used in SC injections on the incidence of ecchymosis15. In this study by Kaplan et al. (15), it was observed that the cold needle (0-2 degrees) used in SC injection reduced the incidence of ecchymosis. This research finding, which differs from the study in the literature, suggests that this may be due to the inability to achieve vasoconstriction in the tissue because of the short injection time. Future studies should standardise the injection time for SC injections using cold needles.

## Conclusion

This study demonstrates that the application of a cold needle (0–2°C) in SC insulin injections significantly reduces pain intensity in the early and mid-term. As a practical and simple method, the cold needle can be used to reduce pain in SC injections. However, cold needles had no significant effect on ecchymosis or comfort levels in the medium to long term; there is limited data in the literature on these issues in SC injections. Future studies are recommended to examine the effects of cold needles more comprehensively by standardizing the injection duration and evaluating comfort in the short, medium, and long term.

*The Limitations of the Study*

This study evaluated the effects of cold needle application only on pain and ecchymosis complications. The lack of investigation into the effects on all complications associated with subcutaneous injections is a limitation.

Additionally, the duration of subcutaneous injection application was not standardized in this study. The lack of standardization of the injection duration is also a limitation of the research.

## Declarations

### *Funding*

This research is not supported by any funding.

### *Conflict of Interest*

The authors declare that there are no conflicts of interest.

### *Ethics Approval*

To conduct the research, ethical approval was obtained from the non-interventional clinical research ethics committee of Kartal Koşuyolu High Specialization Training and Research Hospital (No: 2023117/731) and institutional permission was obtained from the relevant institution (Number: E-15916306-604.01-235409576).

### *Author Contributions*

Plan, design: AY,F.B.; Material, methods and data collection: AY,H.A.,F.B; Data analysis and comments: AY,F.B.; Writing and corrections: AY,F.B

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