The effect of two non-pharmacologic pain management methods for intramuscular injection pain in children

Article *in* Acute Pain · March 2006

DOI: 10.1016/j.acpain.2005.11.001

CITATIONS
23

READS
580

4 authors, including:

Marzieh Hasanpour
Tehran University of Medical Sciences
32 PUBLICATIONS **104** CITATIONS
SEE PROFILE

Mina Tootoonchi
Isfahan University of Medical Sciences
10 PUBLICATIONS **65** CITATIONS
SEE PROFILE

Ghasem Yadegarfar
Isfahan University of Medical Sciences
65 PUBLICATIONS **1,786** CITATIONS
SEE PROFILE

Acute Pain (2006) **8**, 7—12

ELSEVIER

acutepain

www.elsevier.com/locate/acpain

The effects of two non-pharmacologic pain management methods for intramuscular injection pain in children

Marzieh Hasanpour[a,b,*], **Mina Tootoonchi**[a], **Fereshteh Aein**[c], **Ghasem Yadegarfar**[a]

[a] *Faculty Member in Isfahan Medical Sciences University, Iran*
[b] *Nursing and Midwifery School of Isfahan Medical Sciences University, Isfahan, Iran*
[c] *Faculty Member in Shahrekord University of Medical Sciences, Iran*

Received 16 March 2003; received in revised form 1 October 2005; accepted 7 November 2005
Available online 25 January 2006

KEYWORDS
Pain management;
Paediatric nursing care;
Child;
Injection;
Intramuscular;
Clinical trial;
Clinical experiment;
Clinical pain intensity study

Summary
Purpose: To study the effect of local cold therapy and distraction in pain relief using penicillin intramuscular injection in children.
Methods: In this work, 90 children with ages from 5 to 12 who had penicillin injection intramuscularly in a health centre were studied. The samples were chosen randomly and divided into three groups: the first group received local cold therapy, the second group received distraction and the third group (the control group) received routine care. The data were collected through interview and questionnaire. Oucher scale was used to measure pain intensity. Descriptive and inferential statistics were used to analyse the findings.
Results: Average pain intensity in local cold therapy, distraction, and control groups was 26.3, 34.3, and 83.3, respectively.

The findings indicate that pain intensity was significantly higher in the control group than the experimental groups. Also, pain intensity among children was inversely proportional to their age.
Conclusion: This study supports the efficacy of non-pharmacologic pain management methods in children. Nurses are recommended to use local cold therapy and distraction to decrease pain intensity of penicillin intramuscular injection in 5—12-year-old children.

1. Introduction

Pain is one of the most common causes of human suffering. Although pain among adults is consid-

* Corresponding author.
E-mail address: hasanpour@nm.mui.ac.ir (M. Hasanpour).

1366-0071/$ — see front matter © 2005 Elsevier B.V. All rights reserved.
doi:10.1016/j.acpain.2005.11.001

ered a major health problem, it is often ignored in children. Children report injection pain as being awful. In research on hospitalized children, 48% of the injected children mentioned needle injection as very disturbing. Children will deny their pain due to their fear of injections [1]. Most children anticipate the oncoming pain and manifest misbehaviours accompanied with anxiety, resulting in a lot of time wasted to achieve an injection [2]. Children's responses to pain become a nursing problem; behavioural responses among children aged from 1 to 12 years have been reported as significant for venous catheterization and insertion of IV lines [3]. These responses can be so bad that the nurses have to hold the child firmly to do the injection, creating unpleasant experiences for the child and worsening his future responses to injection [4].

Reducing patients' pain is important for all nurses for many reasons. Unnecessary pain can damage the nurse—patient relationship, whereas knowledge of alternative techniques can improve patient care and satisfaction. As advocates for children, nurses are obligated to minimize the emotional and physical effects of painful procedures [5]. Nurses have used various successful methods to control procedural pain such as local cold therapy to inject heparin; however, this method was not effective in vaccination [1]. Distraction has been effective to decrease the pain due to blood sampling and intravenous cannulation vaccination [6]. There are other methods reported such as music distraction for venipuncture [7]. Since these studies have often investigated venous injections and reported different outcomes, other researchers have recommended further studies in different cultural circumstances and with other painful procedures to improve children's pain control at different ages and to be able to generalize the previous findings better [8]. Annually a large number of Iranian children are inflicted with upper respiratory infections (URI) and need penicillin by IM injection for prevention and treatment. This being a very stressful procedure for the children, an appropriate method had to be found to decrease pain and anxiety. Local cold therapy is one of the non-pharmacologic methods used and acts through local skin desensitisation according to gate-control theory [9,10]. Distraction is also a nursing intervention focusing the patients' attention on other stimulants resulting in pain reduction and better pain control in IM injection.

To follow the above goal this research aimed to define and compare pain intensity due to penicillin IM injection using the methods of distraction, cold therapy, and routine procedures among children referred to an outpatient clinic. Procedural pain is generally a poorly researched area, despite the importance of good pain management in this field; as repeated procedures that have poor pain management methods result in patients' experiencing more anxiety and pain. Therefore, this research work has a contribution to make in helping health care professionals manage and reduce procedural pain.

2. Methods

This is an experimental study carried out on three groups of children. The purpose of this study was to evaluate distraction and local cold therapy as two practical and low-cost interventions to decrease injection pain in children. The groups consisted of 5—12 years old children undergoing IM injection of penicillin 6.3.3 in the outpatient clinic. A convenience sample of 90 subjects meeting the sample criteria and having parental informed consent (additional consent by the child if 7 years or older) was selected for participation in the study [11] and was randomly divided into three groups.

The sampling criteria included: children aged 5—12 years who had to undergo IM injection of penicillin 6.3.3 prescribed by a physician; being able to know and report numbers; having no developmental delay or other disabilities that would make communication difficult; receive penicillin 6.3.3 as the only injected medication.

Subjects were excluded from the study if reporting any pain before injection, having diseases other than URI, being too fat or thin (95th percentile < weight < 5th percentile), being non-cooperative or having a blocked needle leading to a delay in injection and needing another injection.

2.1. Procedure

Parents and children were greeted at the registration desk, seated in an open lobby, and given a package containing the research introduction letter and demographic sheet to complete. They were then taken to a private injection room where the research nurse explained the study to the parent and child, answered any questions, and obtained parental informed consent and child consent [11].

The injection techniques in all three groups were consistent. In all three groups, vital signs were checked before the injection.

2.2. Interventions

(1) In the cold therapy group, the subjects were informed that a 2—3 cm piece of ice would be

placed on the injection site on the gluteal muscle for 30 s prior to injection.
(2) In the distraction group, distraction was offered in two ways according to the age and preference of the child: a parallel mirror box with a small doll in the centre was given to subjects, asking them to count the mirror dolls once directly and once inversely, or the subject was asked to sing songs or do deep breathing from 3—5 min prior to the end of injection.
(3) In the control group, a standard injection was given with no further intervention as it is routine in most hospitals.

After injection, the vital signs were assessed as a post test, and then the subjects with their parents were taken to another room to evaluate the pain intensity during injection through the Oucher pain scale by a blinded evaluator.

The randomized, double-blind, controlled trial is the ''gold standard'' for experimental studies, because the design reduces bias, controls for confounding variables, provides for manipulation of the dependent variable and, therefore, allows for cause and effect correlation factor to be determined [12]. In this study, it was impossible to accomplish a true double-blinded study with distracter box or cold therapy as it was obvious to the children which intervention they were receiving.

The Oucher was originally developed in 1988 by Beyer and contains two scales that enable children to rate the intensity of pain: a 0—100 numerical scale for children who count to 100 and six-picture photographic scale of Caucasian children for those unable to count [13]. The African-American Oucher is a self-reporting pain intensity rating tool designed to be used by children 3—12 years developed by Villarruel and Denyes in 1991 [14]. The Oucher scale consists of six photographs of child's face representing ''no hurt'' to ''biggest hurt'' you could ever have, indicates a vertical scale with numbers from 0 to 100. In this study, the numerical scale was used because all of the subjects were able to count to 100. The numerical portion of the Oucher provides at least interval data while the pictorial scale provides ordinal level data [13]. Content validity (Kendall's coefficient 0.7256, $p < 0.01$), convergent and discriminant validity (gamma coefficients 0.732—0.981 and 0.003—0.322) and reliability ($r = 0.54$—0.72, $p < 0.001$) for the African-American Oucher have been established [15,16]. Also, Luffy and Grove's study indicated that the African-American Oucher scale is a valid and reliable tool for measuring pain among children [17,18].

2.3. Instruments

The data were collected through interview and by questionnaire. The questionnaire included three sections: the first section included demographic characteristics such as age, sex, former injection pain intensity and child's pain expectation for the present injection. The second section included a vital sign checklist recording pulse/min, respiration/min and systolic blood pressure (BP). The third section included the Oucher pain scale.

The findings were statistically analysed by SPSS and $a < 0.05$ was considered as significant. In this study, as assessing and measuring children's pain results in quantitative variables with a normal distribution in the three groups, one-way ONOVA was used. And to define the cause of the difference between groups, Shefee test was used. Age distribution was not similar in the three groups, therefore this variable was assessed with co-variance test to find the effect of age on the results [11].

3. Results

The findings of the research showed all the groups were identical regarding sex, previous injection pain and the child's pain expectation of present pain. Males represented 43.2, 53.4 and 53.4% of the groups of distraction, local cold therapy and controls, respectively.

By using Oucher pain scale, most of the subjects in all three groups reported previous injection pain as very high and expected the present injection pain to be also high. The average age in the distraction, cold therapy and control group were 9.4, 9.33 and 7.13 years, respectively. Factorial ANOVA was used to determine the influence of age on treatment and showed age to have no effect on the results. The pain intensity index on the Oucher scale, identifying pain intensity after injection, is presented in Table 1; pain intensity increases from cold therapy to distraction to control groups, respectively.

Table 1 Numerical descriptive pain intensity average according to Oucher scale in all three groups

Groups	Average pain intensity	95% confidence intervals
Controls	83.3 ± 20.9	[41.3,91.1]
Distraction	34.6 ± 19.6	[27.3,41.9]
Cold therapy	26.3 ± 21.9	[18.2,34.5]

Considering the average of 83.3 in the control group, the subjects in this group experienced three times more pain compared to the cold therapy group and twice as much pain compared to the distraction group. ANOVA showed a significant difference in pain intensity between all three groups ($p < 0.001$).

Shefee test was used to define the cause of the difference showing the difference due to distraction and cold therapy groups against controls while there is none between them.

All groups were identical in vital signs before the injection. ANOVA test showed no difference in systolic BP among groups after injection ($p > 5$). However, paired *t*-test showed a significant difference in systolic BP ($p < 0.05$) among groups before and after injection. There was a significant difference in respiration rate in all groups after injection ($p < 0.01$). Also paired *t*-test showed a significant difference in pulse and respiratory rate among groups before and after injection ($p < 0.05$). In conclusion, IM penicillin injection changed BP, pulse and respiration in children and the interventions were effective to reduce pulse and respiratory rate, while not effective on systolic BP. There was a significant effect of interventional methods such as distraction or cold therapy on pain intensity compared to controls as long as groups were corrected for age (ANOVA $p < 0.001$). Regarding sex, ANOVA test showed that sex makes no difference in interventions ($p > 0.05$).

The results also showed a significant correlation between pain intensity and child's pain expectation, also between child's pain expectation and previous pain experience ($p < 0.05$, $r = 0.30$).

4. Discussion

The results show that the cold therapy and distraction methods are effective in decreasing children's pain due to 6.3.3 penicillin IM injection. Some former studies investigating pain control for IV insertion, DPT vaccination and dressing changes in burned children reported that distraction had no effect on reducing pain [19,20,21]. But use of touch and bubble-blowing as two distraction methods could reduce pain perception in DPT immunization and venipuncture in young children [7,8]. Also, one study showed that active distraction was effective in reducing the level of venipuncture pain in girls, in pain-sensitive children and in those with normal WBC [22]. Music distraction has also been effective for IV line insertion in children [23]. These differences may be due to different methods of distraction and painful procedure.

Because distraction acts by mechanism of gate-control theory, it can be effective only when the distracter method is able to distract child's attention away from the pain stimuli [9], so it seems that the parallel mirrors with dolls method could have been effective in distracting the children. The findings of this study show that the effect of distraction on IM injection pain of penicillin 6.3.3 also support a theory which explains distraction by providing the reticular activating system with enough sensory intake to cause other selected stimulation to be ignored [9].

Therefore, distraction appears to be an effective method for decreasing injection pain among children. It is an easy, practical intervention to help children cope with this common painful procedure.

Regarding cold therapy, although the average score of pain intensity was less than the average score for distraction, cold therapy was not statistically better than distraction. On the other hand, to provide analgesia, ice only needed to be applied for 30 s, whereas it was recommended 2 min cold therapy in previous studies [9,17].

Although, the main mechanism of cold therapy according to gate-control theory is emphasized again, we did not study whether these findings could be due to a placebo effect or could be an outstanding result due to fascination of this new technique. Further studies with placebo need to clarify the effect of cold therapy.

Comparison of pulse, respiratory rate and BP before and after injection in the three groups showed a change in these vital signs. Although IM injection can change these vital signs, only changes in pulse and respiratory rate in all groups showed a significant difference, as they were decreased in the two experimental groups and inversely increased in controls. The results of Van Cleve's study showed no significant difference in vitals signs before and after blood sampling of the children [3]. Every stressor can change vital signs by stimulating the sympathetic nervous system. This process can be modified by pain reducing methods such as local cold therapy and distraction. The findings also showed that pain intensity was decreased by age; this may be due to higher sensory perception in younger children and children's own perception of the reason for the injection [3]. The findings of similar studies showed younger children experiencing more severe pain and having more exaggerated reactions to pain [8,21].

There was no significant relation between pain intensity and previous history of injections, but there was a significant correlation between pain intensity and child's pain expectation, also between child's pain expectation and previous pain experi-

ence ($p < 0.05$, $r = 0.30$). In other words, the more painful the previous experience is, the more pain the child expects to experience next time and also experiences. Previous studies showed the same results [6]. This finding highlights the importance of appropriate management of children's first injection experiences in reducing pain intensity in further injection pain.

The possible generalization of the results in paediatric units should be investigated separately, since hospitalized young children often are not able to control their anxiety level in a way that allows health care professionals to treat their conditions without physically restraining them to ensure safety. However, restraint does not typically provide a reduction in anxiety and may intensify fears as well as feelings of helplessness. Because of the negative consequences that may accompany physically restrained children, a trend is underway to reduce anxiety and decrease complications in children experiencing painful or stressful procedures with the use of non-pharmacological pain management [24]. There are more medical procedures needing IM, IV and SC needle injection in which pain relieving methods can be studied too.

Since cold therapy causes local vasoconstriction, which can result in a delay in drug absorption, this should be avoided in cases requiring quick drug absorption. Medical team members are recommended to observe paediatric painful procedures and to assess pain and the interventions should be chosen according to a child's report of pain.

All health team members involved in paediatric injections are advised to avoid deceiving the child before injection by insisting there will be no pain. Children should be assured the health team members would do their best to reduce the pain as much as possible [12].

Further studies of the effect of other non-pharmacological methods such as relaxation or other distraction methods on pain relief due to penicillin intramuscular injection in children are possible and definitely will shed more light.

Acknowledgments

The study was registered under No. 75084 in the Office of Research Coordination, and partly funded by the Isfahan University of Medical Sciences and Health Services, Scientific Research Department.

We would like to thank Professor Tony Bartek, a member of the creative and technical-paper writing committee in the University of Missouri, Mr. Philip B.Ed, N.D. Brown from Perth and Mr. Alex from USA for their editing and providing advice in preparation of the manuscript.

References

[1] Jackson D, Sunders R. Child health nursing. Philadelphia: IB Lippincott Co.; 1993. p. 642.
[2] Marlow D. Pediatric nursing. Translated to Farsi by Arezoomaniance. Tehran: Boshra Co.; 1993. p. 114.
[3] Van Cleve L, Johnson L, Pothier P. Pain responses of hospitalized infants and children to venipuncture and intravenous cannulation. J Pediatr Nurs 1996;11(3):161—8.
[4] Jay S, Elliott CH, Fitzgibbons I, Woody P, Siegel S. A comparative study of cognitive behavior therapy versus general anesthesia for painful medical procedures in children. Pain 1995;62(1):3—9.
[5] Rogers TL, Ostrow CL. The use of EMLA cream to decrease venipuncture pain in children. J Pediatr Nurs 2004;19(1):33—9.
[6] French GM, Painter EC, Coury DL. A technique for pain management during immunization. Pediatrics 1994;93(3):384—8.
[7] Sparks L. Taking the ''ouch'' out of injection for children: using distraction to decrease pain. MCN Am J Matern Child Nurs 2001;26(2):72—8.
[8] Maclaren JE, Cohn LL. A comparison of distraction strategies for venipuncture distress in children. J Pediatr Psychol 2005;30(5):387—96.
[9] Gedaly D. Reducing children's pain distress association with injections using cold: a pilot study. J Am Acad Nurs Pract 1991;4(3):95—100.
[10] Ross S, Soltes D. Heparin and haematoma: does ice make a difference? J Adv Nurs 1995;21(3):434—9.
[11] Burns N, Grove SK. The practice of nursing research: conduct, critique & utilization. Philadelphia: W.B. Saunders Company; 2003.
[12] Powers B, Knapp T. A dictionary of nursing theory and research. London: Sag Publications; 2000.
[13] Beyer JE, Denyes MJ, Villarruel AM. The creation, validation, and continuing development of the Oucher: a measure of pain intensity in children. J Pediatr Nurs 1992;7(5):335—46.
[14] Villarruel AM, Denyes MJ. Pain assessment in children: theoretical and empirical validity. Adv Nurs Sci 1991;14: 32—41.
[15] Beyer JE, Aradine CR. Content validity of an instrument to measure young children's perceptions of the intensity of their pain. J Pediatr Nurs 1986;1(6):386—95.
[16] Aradine CR, Beyer JE, Tompkins JM. Children's pain perception before and after analgesia: a study of instrument construct validity and related issues. J Pediatr Nurs 1988;3(1):11—23.
[17] Luffy R, Grove SK. Examining the validity, reliability and preference of three peripatetic pain measurement tolls in African-American children. Pediatr Nurs 2003;29(1):54—9.
[18] Beyer JE, Knott CB. Construct validity estimation for the African-American and Hispanic versions of the Oucher scale. J Pediatr Nurs 1998;13(1):20—31.
[19] French GM, Painter EC, Coury DL. A technique for pain management during immunization. Pediatrics 1994;93(3):384—8.
[20] Landolt MA, Marti D, Widmer J, Meuli M. Does cartoon movie distraction decrease burned children's pain behavior. J Burn Care Rehabil Jan/Feb, 2002;23(1):61—5.

[21] Carlson KL, Broome M, Vessey JA. Using distraction to reduce pain, fear and behavioral distress in children and adolescents: a multi-site study. J Soc Pediatr Nurs 2000;5(2):75—85.
[22] Press J, Gidron Y, Maimon M, Gonen A, Goldman V, Buskia D. Effects of active distraction on pain of children undergoing venipuncture: who benefits from it. The Pain Clinic 2003;15(3):261—9.
[23] Arts SE, Abu-Saad HH, Champion GD, Crawford MR, Fisher RJ, Juniper KH, Ziegler JB. Age-related response to lidocaine-prilocaine (EMLA) emulsion and effect of music distraction on the intravenous cannulation. Pediatrics 1994;93(5):797—801.
[24] Dresser SH, Melnyk BM. The effectiveness of conscious sedation on anxiety, pain, and procedural complications in young children. Pediatr Nurs 2003;29(4):320—3.