

*Original Article***The effects of regular breathing exercise and making bubbles on the pain of catheter insertion in school age children**

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Abstract

BACKGROUND: Treatment procedures are the most common sources of pain in children. Children with chronic diseases such as thalassemia experience many pains during painful procedures including at times of diagnosis, treatment and control of their disease. Several methods have been reported to reduce pain. Clinical professionals usually use distraction techniques to reduce pain. However, there is no agreement between them that which distraction technique is better for reducing pain. The aim of this study was comparing the effects of regular breathing exercise and making bubbles on the pain of catheter insertion in school age children.

METHODS: This was a clinical trial on 60 children in the age range of 6 to 12 years, who were suffering from thalassemia and had a file in the Center for Thalassemia. Participants were randomly divided into two groups of experiment and control. Bubble making was performed for the first group and regular breathing exercise was performed for the second group. Data were collected using a demographic questionnaire, a scale for pediatric pain behavioral symptoms and Numeric Pain Rating Scale. Data were analyzed using descriptive (frequency, mean and standard deviation) and inferential statistics (ANOVA, Kruskal Wallis, and Mann Whitney U tests and Spearman correlation).

RESULTS: The mean pain score based on the numerical scale was 5.60 ± 3.13 in the control group, 1.60 ± 1.75 in the bubble-making group and 1.85 ± 1.42 in the breathing exercise group. The mean score of behavioral pain symptoms was 3.80 ± 2.80 in the control group, 1.15 ± 1.13 in the bubble-making group, and 0.96 ± 0.75 in the breathing exercise group. Results showed a significant difference in the mean pain scores (based on numeric scale and pain behavior scale) between the control group and other groups after the injection, but the difference in the mean pain scores between the two groups of experiment after the injection was not significant.

CONCLUSIONS: According to the results of this study, both distraction methods of regular breathing exercise and bubble-making can reduce the pain of catheter insertion in children and since there was no difference between their effects, they can be used based on the individual child's interest.

KEY WORDS: Pain, thalassemia, distraction, school-age children.

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Thalassemia is the most common genetic disorder, so that 3% of world populations are carriers of thalassemia gene.¹ According to world's statistics, the rate of thalassemia gene carrier in the Mediterranean

region and Southeast Asia is 5 percent. Iran is also on the thalassemia belt.²

Nowadays, the advancement of technology has led to better diagnosis and control of many chronic diseases including thalassemia. This has

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caused an increase in the number of children suffering from these diseases. The nature of thalassemia is that the children who suffer from it should be hospitalized frequently³ and undergo painful diagnosis and treatment procedures. Establishing intravenous line (IV catheter) is one of the most common invasive procedures that causes pain in these children.⁴ Injection pain in children is so important that is stated as the most stressful aspect of their disease.⁵ For thalassemia patients who are repeatedly exposed to the catheter and its pain and anxiety, providing strategies to reduce the pain and make it bearable is very important. Pain is one of the main nursing diagnoses and nurses can make care plans to reduce it.

There are various pharmacological and non-pharmacological methods to prevent and reduce pain. One of the non-pharmacological methods to reduce pain is distraction.⁶ Distraction method includes visual distraction (counting objects, watching TV), vocal distraction (listening to music), touch–motion distraction (slow regular breathing), and purposive distraction (using toys).⁷ Distraction causes focus on triggers other than pain⁸ and increases tolerance to pain.⁹ Distraction is one of the most practical, easiest and least costly method of non-pharmacological pain relief.¹⁰ A study conducted in the US to compare distraction method with other pain relief methods such as EMLA cream showed that distraction was more effective in reducing the pain in children who referred for vaccination.¹¹ However, some other studies such as that of Hassanpour et al. (2006), which aimed to compare distraction method and cryotherapy showed that both methods were effective in reducing injection pain.¹²

Considering the variety of distraction methods, studies showed that various distraction methods can have a great effect in reducing pain in children.^{13,14}

Almost all studies approved the effect of distraction on reducing pain in patients, but the effects of these methods on reducing pain of children who suffer from thalassemia and have to frequently undergo painful procedures have

been less studied. The existing studies have mainly compared distraction with other methods such as EMLA cream⁴ and cryotherapy and have not paid attention to compare two methods of distraction. It seems that comparing two methods of distraction help nurses to find the most effective method and use it if possible. The researcher's experiences of working with children with thalassemia have led to designing this study based on personal experiences and existing literature. First, pain relief in children at the time of injection is less paid attention by nurses and strategies to reduce pain are rarely used. Second, due to the big load of duties, nurses do not have enough time to learn methods for children, which require long term learning, even when they pay attention to distract children from pain. Therefore, if some simple methods such as bubble making that children do it easily can have the same effects of other methods such as breathing exercise and can replace them, it may be recommended to nurses to solve the problem of lack of attention to pain relief, while saving nurses' time and make it possible for them to pay more attention to their jobs. It should be mentioned that children are more attracted to games, which in addition to distract them from pain, make the hospital environment attractive to children and make them accept treatment better. Therefore, comparing these two methods in a research project can achieve such objectives.

Based on the above discussion, this study aimed to compare the effectiveness of regular breathing exercise and making bubbles on the pain of catheter insertion in children suffering from thalassemia who referred to the Thalassemia Center in the city of Kerman.

Methods

This was a clinical trial on 60 children in the age range of 6 to 12 years, who were suffering from major thalassemia and referred to the Center for Thalassemia in the city of Kerman (Kerman is one of the biggest cities in Iran and is the center of Kerman province in the South East Iran. This city is the central part of Kerman ward and its population according to the 2006 census by the

Statistical Center of Iran is 515,114). in 2010, who met the entry criteria. The sampling was convenient method and participants were randomly divided into three groups (2 experiment and 1 control groups). Entry criteria included age range of 6 to 12 years old, having medical file in the Thalassemia Center and be willing to participate in the study. Those children who had physical problems (verbal, mental, visual and hearing) and psychological problems or were using pain relief or anxiety medicine were excluded from the study.

After obtaining permission from the Thalassemia Center, sampling was started. The researcher introduced herself to the participants and obtained written consent from the parents and verbal consent from the children and then, divided them randomly into three groups. The random selection was based on throwing dice. In one group injection was done in the usual way of the ward (without any activity for pain relief) and in the two other groups, distraction methods of bubble making toy for one group and regular breathing exercise for the other group were practiced.

In the bubble-making group, children were instructed to use bubbles and were asked to do it one minute before and during catheter insertion until fixation of angiocath. In the breathing exercise group, children were taught how to do regular breathing exercise and were asked to do it one minute before and during catheter insertion until fixation of angiocath. For this group, breathing method of Hey-hu was applied. In this method, first child takes a deep breath, exhale while whispering Hey, then inhale deeply again and exhale whispering Hu. The reason for choosing bubble-making toy and breathing exercise was to compare two different methods of distraction, game therapy and touch-motion therapy. Also, the other reason for using this toy was being inexpensive and being suitable for both boys and girls. Data were collected using a demographic questionnaire, a scale for pediatric pain behavioral symptoms and Numeric Pain Rating Scale. Demographic data questionnaire was completed by interviewing the child or one of the parents.

In the next stage, the behavioral pain scale during procedure in children of all three groups were observed and recorded. Behavioral pain scale was used to determine the severity of pain of catheter insertion through children's reactions during injection.

This scale includes five sections of face, leg, activity, cry and soothability. Each section has a score of 0-2 and higher scores show more reaction to pain. The score of each section are recorded separately and then, the scores of all 5 sections are added to calculate the total score of pain. The range of score is from 0 (the lowest) to 10 (the highest).¹⁵ The researcher scored the scale by observing children's behavior during injection. The reliability of this instrument is assessed in previous studies, including Hamed Tavassoli (1387) who calculated a reliability of $r = 74\%$ and Lwuz et al. (2002) who reported a reliability of $r = 88\%$.^{3,16} The validity of this instrument was approved by content analysis by ten nursing teachers.

After injection, children's pain was assessed by numerical pain scale. This scale was showed to the children and they were asked to choose their pain from numbers 0 to 10. The linear scale of zero to ten for pain is a standard scale to assess pain. For some patients such as children and elders, using visual scale without signs is difficult. Therefore, in such cases, ranking scales, simple scales of describing pain or numerical scale of 0 to 10 can be used.⁶ Validity and reliability of this scale is also approved by other studies.¹⁷ The nurse responsible for catheterizing, size, type and manufacturer of angiocath, side of injection and environmental conditions were the same in all cases. Data were analyzed using descriptive (frequency, mean and standard deviation) and inferential statistics (ANOVA, Kruskal Wallis, and Mann Whitney U tests and Spearman correlation).

Results

The results of the present study showed that 56.7% of subjects were female and 43.3 were male. Chi square test showed that the three groups were matched regarding the gender ($p = 0.622$). The mean age in bubble-making group

Table 1. Comparing the mean pain severity in study subjects according to behavioral and numerical pain scales among the three groups using Kruskal Wallis test.

| Group Mean | Control | Bubble-making | Breathing exercise | Statistical test | Result |
|------------------|-------------|---------------|--------------------|------------------|-----------|
| Numerical scale | 3.13 ± 5.60 | 1.75 ± 1.60 | 1.42 ± 1.85 | Kruskal Wallis | P = 0.000 |
| Behavioral scale | 2.80 ± 3.80 | 1.13 ± 1.15 | 0.96 ± 0.75 | Kruskal Wallis | P = 0.000 |

was 9.55 ± 2.30 , in breathing exercise it was 10.25 ± 1.33 and in the control group it was 9.90 ± 2.38 years and ANOVA showed no significant difference among the three groups regarding age ($p = 0.127$).

Kruskal Wallis test showed a significant difference among the three groups regarding the severity of pain based on numerical pain scale ($p = 0$). Also, using Kruskal Wallis test, a significant difference was seen between the three groups regarding the severity of pain based on behavioral pain scale ($p = 0$, table 1).

Comparing the mean score of numerical pain scale between the two groups of control and bubble-making, and between the two groups of breathing exercise and control by Mann Whitney U test showed a significant difference ($p = 0$), but there was no significant difference between the two groups of bubble-making and breathing exercise ($p = 0.323$). In addition, comparing the mean score of behavioral pain scale between the two groups of control and

bubble-making and also between the two groups of breathing exercise and control by Mann Whitney U test showed a significant difference ($p = 0$), but there was no significant difference between the two groups of bubble-making and breathing exercise ($p = 0.253$, table 2).

There was a direct and significant correlation between the numerical pain scale and behavioral one using Spearman correlation ($\rho=0.674$, $p < 0.001$). There was a reverse and significant correlation between the increase of age and numerical pain scale using Spearman correlation test, so that with the increase of age, the reported score of pain was lower ($\rho=-0.278$, $p < 0.05$). There was also a reverse and significant correlation between the increase of age and behavioral pain scale using Spearman correlation test ($\rho = -0.359$, $p < 0.01$).

While the mean score of pain based on numerical pain scale in girls (3.02 ± 2.65) was a little higher than that in boys (3 ± 3.17), Mann Whitney U test showed no significant difference

Table 2. Comparing the mean pain severity in the study subjects according to the behavioral scale and numerical scale of pain among different groups.

| Group Mean | | Numerical scale | Behavioral scale | test | Result | |
|--------------------------------------|--------------------|-----------------|------------------|----------------|-----------------|------------------|
| | | | | | Numerical scale | Behavioral scale |
| Bubble-making and breathing exercise | bubble-making | 1.75 ± 1.60 | 1.13 ± 1.15 | Mann Whitney U | P = 0.323 | P = 0.253 |
| | breathing exercise | 1.42 ± 1.85 | 0.96 ± 0.75 | | | |
| Bubble-making and control | bubble-making | 1.75 ± 1.60 | 1.13 ± 1.15 | Mann Whitney U | P = 0.000 | P = 0.000 |
| | control | 3.13 ± 5.60 | 2.80 ± 3.80 | | | |
| Breathing exercise and control | breathing exercise | 1.42 ± 1.85 | 0.96 ± 0.75 | Mann Whitney U | P = 0.000 | P = 0.000 |
| | control | 3.13 ± 5.60 | 2.80 ± 3.80 | | | |

between the two groups ($p = 0.678$). However, the pain score based on behavioral pain scale in boys (2.30 ± 2.66) was higher than that in girls (1.58 ± 1.78), even though Mann Whitney U test showed no significant difference ($p = 0.324$).

Discussion

The results of this study showed a significant difference in the mean pain score among the three groups of breathing exercise, bubble-making and usual method, but no significant difference between the children's mean score of pain in the two groups of bubble-making and breathing exercise. Considering that there was no significant difference among these three groups regarding various variables such as age, gender, etc. and the only independent impact factor was distraction, it can be concluded that distraction was effective in reducing children's pain. Many studies have mentioned the effect of distraction methods on pain relief. Cohen (2007) reduced vaccination pain and distress in babies¹⁸ and Bellieni (2006), Windich-Baimer (2007) and Hassanpour (2006) in different studies reduced the pain of catheter in children's of school age using distraction methods.¹⁹⁻²¹ The results of the study of Sinha et al. (2006) showed that distraction could reduce the pain of stitching in children under 10 years old.²¹

The results of this study showed no significant difference between the two distraction methods of breathing exercise and bubble-making, while other studies difference between various methods. Esmaeili et al. (2008) and Valizadeh et al. (2004) compared two methods of breathing exercise and music on pain of catheter at the time of blood transfusion and found that although both methods reduced children's pain significantly, the effect of music was more than breathing exercise.^{22,23}

Broome et al. (1998) used regular breathing technique on children with cancer at the time of pulling CSF and the pain was significantly reduced.²⁴ Manne et al. (1994) used a tool called crystal party for regular breathing to distract from catheter and it reduced the pain significantly.²⁵

The results showed that bubble-making during injection as compared to the usual method

can reduce children's pain. This result approves the finding of Alavi et al. (2005) who used bubble-making toy to reduce children's pain of catheter.⁴ In the study of Gupta et al. (2006) also distraction by using musical ball reduced the pain of catheter in school age children who underwent elective surgery.²⁶

Another finding of this study was no significant correlation between gender and self-reported pain and behavioral pain. The results of a study by Arts et al. also found no significant effect for gender on severity of pain and behavioral reactions, which is in agreement with the current study.²⁷ Tootoonchi also found no significant relationships between the severity of pain and gender.²⁸ Moreover, in the present study, there was a significant reverse relationship between the age and the score of numerical scale in two behavioral scales so that by increasing age, the score of reported pain decreased. Arden (2006) also believed that age is an effective factor in the severity of pain and as the age increases, the tolerance to pain increases too.²⁹ The results of other studies also showed reverse relationship between pain and age. In the study of Pourmovahed et al. (2008), the mean score of pain severity in the children of 10-12 years old was lower than those of 6 to 9 years old.³⁰

Conclusions

The results of the present study showed that distraction reduced pain of injection procedures in children of school age who suffer from thalassemia. Therefore, by using simple methods such as a bubble-making toy or breathing exercise according to the child's choice and cooperation, the destructive experience of invasive painful procedures in children with chronic disease who experience a lot of pain during painful procedures such as diagnosis, treatment and control of their diseases can be reduced. Since in the children's centers for treatment of thalassemia, currently nothing is done for distraction, the results of this study recommend using these methods to reduce pain in children with thalassemia.

Considering the key role of nurses in health care team, we hope that the results of this study help them reduce pain and undesirable mental, emotional and physical complications of hospitalized children who undergo painful procedures.

The authors declare no conflict of interest in

this study.

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References

1. Hahalis G, Manolis AS, Apostolopoulos D, Alexopoulos D, Vagenakis AG, Zoumbos NC. Right ventricular cardiomyopathy in beta-thalassaemia major. *Eur Heart J* 2002; 23(2): 147-56.
2. Hasan Pour Dehkordi A, Delaram M, Safdari F, Salehi SH, Hashemi Nia AM, Kasiri KA, et al. Comparison lecture and booklet on the knowledge of parents of children with thalassemia major on how to care for their children. *Journal of Shahrekord University of Medical Sciences* 2008; 10(2): 52-8.
3. Tavasoli HS. Comparison of effect of orientation programs play fast, think on pain and anxiety, injection procedures and parental satisfaction in children before school age thalassemia Gilan, [MSc Thesis] Tehran: School of Medical Sciences, Tarbiat Modarres University; 2008.
4. Alavi A, Zargham A, Abd Yazdan Z, Namnabati M. Comparison of Distraction effects and cream (EMLA) on pain intensity catheter insertion in children 12-5 thalassemia. *Journal of Shahrekord University of Medical Sciences* 2005; 7(3): 9-15.
5. Brown J. Using lidocaine for peripheral i.v. insertions: patients' preferences and pain experiences. *Medsurg Nurs* 2003; 12(2): 95-100.
6. Ball J, Bindler RM. *Pediatric nursing: caring for children*. 3rd ed. New Jersey: Prentice Hall; 2003. p. 52.
7. Taylor C, Taylor C, Lillis C, LeMone P, Lynn P. *Fundamentals of nursing: the art and science of nursing care*. 6th ed. Philadelphia: Lippincott Williams & Wilkins; 2008.
8. DeMore M, Cohen L. Distraction for Pediatric Immunization Pain: A Critical Review. *Journal of Clinical Psychology in Medical Settings* 2005; 12(4): 281-91.
9. Christensen J, Fatchett D. Promoting parental use of distraction and relaxation in pediatric oncology patients during invasive procedures. *J Pediatr Oncol Nurs* 2002; 19(4): 127-32.
10. Hockenberry MJ, Wilson D, Rentfro AR, McCampbell LS. *Wong's Nursing Care of Infants and Children*. 8th ed. Philadelphia: Elsevier Science Health Science div; 2006. p. 220.
11. Cohen LL, Blount RL, Cohen RJ, Schaen ER, Zaff JF. Comparative study of distraction versus topical anesthesia for pediatric pain management during immunizations. *Health Psychol* 1999; 18(6): 591-8.
12. Hassanpour M, Tootoonchi M, Aein F, Yadegafar G. The effect of two non - pharmacologic pain management methods for intramuscular injection pain in children. *Acute Pain* 2006; 8(1): 7-12.
13. Huth MM, Broome ME, Good M. Imagery reduces children's post-operative pain. *Pain* 2004; 110(1-2): 439-48.
14. Caprilli S, Anastasi F, Grotto RP, Scollo AM, Messeri A. Interactive music as a treatment for pain and stress in children during venipuncture: a randomized prospective study. *J Dev Behav Pediatr* 2007; 28(5): 399-403.
15. Nilsson S, Finnstrom B, Kokinsky E, Enskar K. The use of Virtual Reality for needle-related procedural pain and distress in children and adolescents in a paediatric oncology unit. *Eur J Oncol Nurs* 2009; 13(2): 102-9.
16. Voepel-Lewis T, Merkel S, Tait AR, Trzcinka A, Malviya S. The reliability and validity of the Face, Legs, Activity, Cry, Consolability observational tool as a measure of pain in children with cognitive impairment. *Anesth Analg* 2002; 95(5): 1224-9, table.
17. Aghdami M. Effect of Distraction on anxiety and pain of children under school age Tansilkotomy, [MSc Thesis] Tehran: School of Medical Sciences, Tarbiat Modarres University; 2008.
18. Cohen LL, MacLaren JE, Fortson BL, Friedman A, DeMore M, Lim CS, et al. Randomized clinical trial of distraction for infant immunization pain. *Pain* 2006; 125(1-2): 165-171.
19. Bellieni CV, Cordelli DM, Raffaelli M, Ricci B, Morgese G, Buonocore G. Analgesic effect of watching TV during venipuncture. *Arch Dis Child* 2006; 91(12): 1015-7.
20. Windich-Biermeier A, Sjoberg I, Dale JC, Eshelman D, Guzzetta CE. Effects of distraction on pain, fear, and distress during venous port access and venipuncture in children and adolescents with cancer. *J Pediatr Oncol Nurs* 2007; 24(1): 8-19.

21. Sinha M, Christopher NC, Fenn R, Reeves L. Evaluation of nonpharmacologic methods of pain and anxiety management for laceration repair in the pediatric emergency department. *Pediatrics* 2006; 117(4): 1162-8.
22. Esmaeli K, Iran Far SH, Afkari B, Abasi P. Comparing the efficacy of breathing exercises and music to reduce pain during the administration of blood vessels determined. *Faslname Behbood* 2008; 12(2): 129-39.
23. Valizadeh F, Shahabi M, Mehrabi Y. Comparing the efficacy Distraction breathing exercises and music. *Lorestan University of Medical Sciences Journal* 2004; 22(6): 43-50.
24. Broome ME, Rehwaldt M, Fogg L. Relationships between cognitive behavioral techniques, temperament, observed distress, and pain reports in children and adolescents during lumbar puncture. *J Pediatr Nurs* 1998; 13(1): 48-54.
25. Manne SL, Bakeman R, Jacobsen PB, Gorfinkle K, Redd WH. An analysis of a behavioral intervention for children undergoing venipuncture. *Health Psychol* 1994; 13(6): 556-66.
26. Gupta D, Agarwal A, Dhiraaj S, Tandon M, Kumar M, Singh RS, et al. An evaluation of efficacy of balloon inflation on venous cannulation pain in children: a prospective, randomized, controlled study. *Anesth Analg* 2006; 102(5): 1372-5.
27. Arts SE, Abu-Saad HH, Champion GD, Crawford MR, Fisher RJ, Juniper KH, et al. Age-related response to lidocaine-prilocaine (EMLA) emulsion and effect of music distraction on the pain of intravenous cannulation. *Pediatrics* 1994; 93(5): 797-801.
28. Tootoonchi M. Effect of local cooling therapy and Distraction on pain intensity in intramuscular injection. Isfahan: Isfahan Medical University; 1997. p. 40-50.
29. Urden LD, Stacy KM, Lough ME. *Thelan's critical care nursing: diagnosis and management*. 5th ed. Philadelphia: Mosby; 2006. p. 185-93.
30. Pourmovahed Z, Salimie T, Dehghani K, Yassinie M, Shakiba M, Tavangar H, et al. Comparative Study of the Effect of Music Distraction and Emla Cream on Pain of the Children During Intravenous Cannulation. *Biomonthly Iran Journal of Nursing* 2008; 21(55): 47-53.