Original Article

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Effect of Facilitated Tucking with the Nurse and a Simulated Hand on Physiological Pain Index During Vein Puncture on Premature Infants

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ABSTRACT

BACKGROUND AND OBJECTIVE: Painful and stressful stimuli increase catecholamine, heart rate, blood pressure and increase the intracranial pressure of the baby. Facilitated tucking is a simple technique that makes the baby control her body better. Therefore, this study was performed to compare the effects of fetal status with hands of nurses and simulated hand on the physiological indices of pain during venipuncture in preterm infants.

METHODS: The present experimental study was performed on 99 preterm infants admitted to the intensive care unit of Amin and Shahid Beheshti hospitals of Isfahan and in three groups of 33 patients (two groups of test and one control group). In one of the test groups during venipuncture procedure neonates were placed in facilitated tucking by nurse's hand and in the other group by simulated hands. Before, during and after the intravenous route, the respiratory rate, pulse rate and arterial oxygen saturation were recorded using monitors.

FINDINGS: The mean of arterial oxygen saturation during and after venipuncture in the nurses' hand group were (93.04±6.13) and (94.3±56.44) and in simulated hand group were (95.2±21.11) and (94.2±50.86%) which had no significant difference ($p<0.05$). Between the mean respiratory rate, during and after the venipuncture in the nurses' hand (49.9±85.88) and (54.11±03.85) with simulated hand group (50.64±11.48) and (57.10±96.82) was not significantly different.

CONCLUSION: The results of the study showed that the use of nursing hands and simulated hands to put a premature infant in a facilitated tucking is effective equally in controlling the physiological indices.

KEYWORDS: *Facilitated tucking, Nurses, Hand, Pain, Pulse, Respiration, Saturated oxygen, Infant, Premature*.

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Introduction

With the advancement in medical care, the survival of premature infants and newborns with congenital anomalies has increased dramatically, but these infants are exposed to high stressors, painful and stressful experiences (1,2), and on average, every premature infant is exposed to 14 painful procedures per day (3) and most of these procedures are performed without any pharmacological and non-pharmacological reliever (4), while the fibers that drive pain stimulation are formed in the fetal period, and premature infants may even be more sensitive to pain than term neonates (5). Painful and stressful stimuli increase catecholamine, increase heart rate, increase blood pressure and increase the intraocular pressure of the baby (6).

In the absence of attention to pain and pain relief, there are consequences such as impaired sleep, growth and development and tolerance to nutrition (7). Therefore, preventing pain and controlling it should be considered as part of nursing care in order to prevent long-term or short-term destructive effects of pain (8). Nurses can take medication and non-pharmacological interventions to relieve pain. The use of analgesics to reduce the pain of short-term prostheses is not recommended in premature infants due to its low potential and potential side effects. But non-drug interventions are not only convenient and inexpensive but can be used without prescribing physicians and well tolerated by infants (9). One of the non-drug interventions is fetal status, which can be used as a critical evolutionary and complementary care to relieve the stress and pain of infants in the neonatal intensive care unit (10). Fetal status is a simple technique in which the baby is placed on one side, the arms and legs are folded in the midline of the body (11).

This situation makes the baby control her body better (3). Lopez et al. (12) and Alinejad Naeini et al. (13) reported positive effects of fetal status on pain relief in newborns. But the use of this method requires the use of more force, which may be avoided due to the high workload per shifts (14). The advancement of technology in medical science has made possible improvements to the quality of care, including the creation of a Zaki gloves that is a supportive pillow and emulates human arms.

In a study that examined the effect of simulated parental hands on neonates (from physiological and behavioral patterns), it showed more self-relaxation behaviors, fewer periods of apnea and bradycardia in neonates (15). Regarding the novelty of this device and limited studies on its efficacy, the present study aimed to compare the effect of fetal status with nursing hands and simulated hands on the physiological parameters of pain during venipuncture in preterm infants.

Methods

This experimental study was approved by the ethics committee of Shahid Sadoughi University of Medical Sciences in Yazd with the code: IR.SSU.REC.1394.22 and registered at the clinical trial site with the code: IRCT: 20160601128205N1 and obtained permission from the Neonatal Health Department of the Ministry of Health and Medical Education on preterm infants admitted to the neonatal intensive care unit of the Amin and Shahid Beheshti hospitals of Isfahan in 2016. Premature infants with a fetal age of between 28 and 36 weeks requiring an intravenous route were enrolled in the study, and after leaving the special care unit, the level three and entry into special care for neonates with a moderate level, gestational age less than 28 weeks and above 37 weeks, receiving drugs such as opiate and analgesics and newborns with withdrawal syndrome, hypothermia, hyperthermia, hypo or hyperglycemia, requiring mechanical ventilation, requiring surgery, fifth minute Apgar less than 7 were not studied. Also, if more than one attempt was made to inject the venipuncture in the newborn, or the onset of apnea in the newborn during the intervention, and the parents' reluctance to continue the study during the study, they were excluded.

Available sampling was done by random assignment of a simple type in lottery form from the beginning of January 2009 to June of this year. The newborns were divided into three groups (each group 33 neonates). Venipuncture was performed for the neonate in the control group according to the routine. In the simulated hand group, the baby was placed in a fetal condition with the help of gloves made by nurtured company. In the nursing hand group, the infant was placed in a fetal condition by the master student of nursing care for neonates.

Data were collected by demographic questionnaire and physiological indexes (heart rate, arterial oxygen saturation and respiration rate). After obtaining written consent from parents, the researcher identified the participant group by lottery. The first group was placed under a fetal position by nurse hand, the second group was placed under a fetal position with gloves or the same simulated hand, and the third group was control

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group and under routine procedure. In all three groups, for monitoring the heart rate and arterial oxygen saturation, a monitoring probe (Saadat monitor, 1800S, Iran) was used. Within 30 minutes, the necessary equipment was prepared for the venipuncture, and the trend section of monitor was activated and ensure the correct functioning of the monitor and the corresponding probe.

For venipuncture, a Barnwell was used for the same number with a Meditex brand and number 24. A nurse responsible for respiratory counting recorded a respiratory rate as the baseline (zero) at 30 minutes after the baby was quietly controlled without manipulation. For accurate recording of the respiratory rate, a chronometer was used with the Q & Q made in China, and was calibrated for confirmation of reliability in collaboration with the hospital's medical equipment unit. In the nurses' hand group, one hand was placed on the head of the infant and the other on the lower limbs and legs and the baby was kept in a curved position in the form of C (Figure 1).

Figure 1. Premature neonate with simulated hand

The nurse responsible for venipuncture was presented in neonate's bedside and after selecting the appropriate venous route and performing the initial steps for establishing the venous route, stated the readiness for the initiation of the procedure, and as soon as the Branwell insertion second record of respiratory rate was recorded by the nurse responsible for the registration. After verifying the function and fixation of the venous route and announcing the completion of the venipuncture procedure by the nurse responsible for the intravenous route, the researcher continued to maintain the baby in fetal condition for 5 minutes after completing the fixation. At the end of the fifth minute, the nurse responsible for the measurement did the third registration. In the simulated hand group, the researcher placed neonate on fetal position with a simulated hand while the first simulated fingers were placed on the head and supported the neonate's head. The second simulated hand was supported by the fingers of the neonate's legs, and the back bundle of the forearm was supported by both hands simulated. After announcing the correct position, the nurse was present on the bedside of the neonate and the rest of the procedure was performed as a nurse's hand. In the control group, the infant was subjected to neonatal vigilance according to the routine, and physiological indicators were recorded in the other two groups. In this research, the statistical tests of Kolmogorov-Smirnov, Chi-square, analysis of variance with repeated measurements and LSD post hoc test were analyzed by SPSS software version 18 and $p < 0.05$ was considered significant.

Results

According to the results of the Kolmogorov-Smirnov test, the data related to the variables had normal distribution, so parametric tests were used. There was no significant difference between the three groups in terms of age, sex, temperature and embryonic weights. There was no significant difference in the number of pulses and respiration (in terms of number in minutes) and arterial oxygen saturation (in percent) in the pre intervention stage.

There was no significant difference between the mean heart rate of the studied groups in both groups during and after the intervention. But in intra-group comparison, heart rate changes in the control group before and during the next stage and in the nursing hand group were significantly different before and during the next stage ($p=0.001$). The mean of arterial oxygen saturation during the intervention in the control group (88.6±77.44), nursing hand group (93.4±60.13) and simulated hand group (95.2±21.11). There was a statistically significant difference between the groups ($p=0.001$), which was between simulated hand group and control group and the control group with the nursing hands group.

The mean of arterial oxygen saturation after intervention in control group was (91.6±30.17), simulated hand group (94.2±50.86), nursing hand group (94.3±56.44) ($p= 0.001$). Between the control group and simulated hand group and control group with nursing hand group. In the intra-group comparison, only the control group had a significant difference between the mean values of arterial oxygen saturation before, during and after the intervention ($p=0.001$).

The mean of respiratory rate during the intervention in the control group was (64.13±45.69), the simulated hand (50.64±11.48) and the nursing group (49.9±85.87)

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(p=0.001). The mean of respiratory rate after intervention in the control group was (64.17±45.36), the simulated hand group (57.10±96.82) and nursing hand group (54.11±03.85). There was a significant statistical difference between the groups (p=0.001). In intra-group comparison, there was a significant difference in the number of respiration only in the control group before, during and after the intervention (p=0.001) (Table 1).

Table 1. Comparison of pulse, respiration, arterial oxygen saturation before, during and after intervention in three groups of preterm infants admitted to the neonatal intensive care unit of Amin and Shahid Beheshti hospitals in Isfahan

Group	Intervention Time	Before Mean±SD	During Mean±SD	After Mean±SD	P-value
Heart rate (pulse per minute)	Control	146.3±19.3[a]	164.94±25.08[b]	146.97±14.14 [a]	p=0.001
	Stimulated hand	150.58±15.9[a]	154.97±20.41[ab]	153.61±13.6 [a]	p>0.05
	Nursing hand	148.39±14.59[a]	160.45±16.31 [b]	151.09±17.62 [a]	p=0.001
p-value		p>0.05	p>0.05	p>0.05	-
respiration	Control	59.91±16.79[a]	64.45±13.99 [b]	64.45±17.36 [b]	p=0.001
number per minutes	Stimulated hand	55.33±14.62[a]	50.11±64.48[a]	57.96±10.82 [a]	p>0.05
	Nursing hand	52.27±11.49[a]	49.85±9.87 [a]	54.03±11.85 [a]	p>0.05
p-value		p>0.05	p=0.001	p=0.001	-
Saturated arterial oxygen (%)	Control	94.3±4.39 [a]	88.7±6.44 [b]	91.3±6.17 [c]	p=0.001
	Stimulated hand	95.27±2.41 [a]	95.21±2.11 [a]	94.5±2.86 [a]	p>0.05
	Nursing hand	94.06±3.3 [a]	93.06±4.13 [a]	94.56±3.44 [a]	p>0.05
p-value		p>0.05	p=0.001	p=0.001	-

Discussion

The findings of this study showed that in the first stage and before the intervention, the mean heart rate of the groups was at the same but venipuncture resulted in an increase in the heart rate in each of the three groups, this increase was more pronounced in the control group than simulated and the nursing hand group. In line with the results of Herrington et al., investigated the effect of touch on the response of premature infants under the venipuncture of the heel, the increase in heart rate was 14.5 in the control infant group (16).

However, Reyhani et al. evaluated the effect of fetal status during IV blood sampling on physiological indices in premature infants, indicated that the changes in heart rate in the intervention group during the bleeding were less than the control group (1), which was not consistent with the results of this study and the cause of this difference can be the difference in the duration of the maintenance of infants in embryonic ovulation in two studies. The results of this study showed that the neonates in the control group had a higher loss of arterial oxygen saturation during the sedation than nurses and stimulated hand groups. In line with these results, the study of Beheshtipour et al found that there was a significant reduction in the amount of arterial oxygen saturation of infants under heel-tip sampling, which did not receive support (17), But Kucukoglu et al., evaluated the effect of fetal position on reducing the pain caused by vaccine injection in neonates, and the results indicated that the fetal position was ineffective on the amount of arterial oxygen saturation that was not consistent with the result of the present study, and this difference could be due to different samples of this study (neonates over 37 weeks) and the method of this study (placement in the fetal position one minute before injection of the vaccine) (18) with the present study. Another finding of the present study was the effect of fetal positioning with nursing hands and simulated hands on the respiratory rate of neonates under the venipuncture, and the results of Herrington et al. were consistent with this finding, which showed that the touch can prevent increasing the number of respiration during the heel-tip sampling of the premature infant (16). Overall, interpreting the reduction in respiratory rate in the hand and gloves groups and returning it to the base level can be found in the study by Ministério et al., which states that the presence of a newborn in a supportive state, serum cortisol levels are changed, beta-endorphin levels are increased and consequently, the infant undergoes less stress in the invasive procedure, the transmission of painful stimulants are blocked by afferent fibers and modulation in the perception of painful stimuli and self-regulation facilitates (19). In general, the results of this study

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showed that the placement of premature infants in a fetal condition using nursing hands or simulated hands is effective in maintaining the stability of respiration and oxygen saturation in preterm infants and can be used and the simulated hand can be used instead of the nursing hand in case of necessity.

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