Original Article

Effect of Tactile-Kinesthetic Stimulation on Motor Development of Low Birth Weight Neonates

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Objective: Low Birth Weight neonates need complementary interventions (e.g. tactile kinesthetic stimulation) to promote their development. This study was conducted to determine the effect of Tactile-Kinesthetic Stimulation (TKS) on motor development of Low Birth Weight neonates.

Method: In this clinical trial study, sample was made out of 40 inborn LBW neonates who were divided into two groups randomly. TKS was provided for three 15-minute periods per day for 10 consecutive days to the test group, with the massages consisting of moderate of pressure strokes in prone position and kinesthetic exercises consisting of flexion and extension of limbs in supine position. All measurements were taken before and after completion of the study with the same equipment and by the same person.

Results: Results indicated that motor behavior in the intervention group was significantly higher than the control group after the 10 days TKS (P-Value≤0.0001).

Discussion: TKS could be an effective intervention in development of motor behavior of LBW neonates. Because very little is known about neonate's behavior, it seems to need more studies in other aspects of behavior in LBW neonates.

Keywords: Tactile-Kinesthetic Stimulation, Low Birth Weight neonate, Motor development

Introduction

With advances in neonatal intensive care, the chance of survival of high-risk infants (Low Birth Weight and Preterm infants) has been considerably improved (1). Researchers have found that these infants are at risk for poor developmental outcomes and it is reported that LBW infants who stay alive, may suffer from long-term and short-term physical, mental and social problems 2 or 3 times more than appropriate birth weight infants, so it seems that these infants need to receive early interventions (2). Recent studies suggest that early intervention during infancy may be most effective because there is high plasticity of the brain. Also prerequisite for early intervention is early detection of high risk neonates for developmental disorders and neurological dysfunctions and also precise instruments and tools (3). Neonatal Behavioral Assessment Scale (NBAS) is a structured examination to demonstrate both negative and positive characteristics of infant's behavior. The motor system in NBAS includes the general tone, motor maturity, pull-to-sit, defensive, and activity level (4). Various forms of supplemental stimulation have been provided for LBW neonates (for example touch, vision, auditory). Tactile-Kinesthetic Stimulation (TKS) stands out among the effective interventions. Also in the first days of life, the responsiveness of neonates to this stimulation is greater than any other sensory modality (5). A number of studies have shown positive effects of TKS on weight gaining of LBW and preterm infants (5, 6, 7, 8). In some of the studies, the researchers verified the effect of TKS on reducing the length of hospital stay of LBW and preterm infants (5, 6). Because very little is known about TKS effects on motor development, the purpose of present study was to determine the effects of TKS on motor development of LBW neonates who had stayed in Post Neonatal Intensive Care Unit (Post NICU).

Materials and Methods

This was a Randomized Controlled Trial (RCT) study type. The study was carried out on LBW neonates in Akbar-abadi Hospital of Tehran. The

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study sample was made out of 40 inborn LBW neonates, who fulfilled the following criteria: 1) Birth weight (BW) >1500 g and <2499 g, 2) Age of neonates were 1 day 3) Absence of congenital anomalies and neuromuscular disorders 4) Being Medically stable with no requirement of drugs (other than mineral and vitamin supplements), or any specific interventions.

After informed consent was taken from all parents, neonates were randomly assigned to the treatment and control groups based on a stratification of gestational age, birth weight, birth length, head circumference at birth, gender, Apgar scores (1 and 5 min), prematurity or Intra Uterine Growth Retardation (IUGR).

The study was approved by the Research Ethics Committee of Rehabilitation College in Tehran University of Medical science. After gathering of clinical data, all neonates were evaluated by NBAS and clinical data and results of evaluation of motor states were collected and TKS was provided for three 15 minute periods per day from first day of life for 10 consecutive days to the treatment group. Sessions began 30 minutes after a feeding in the morning (at 8 AM, 11 AM, and 1 PM). Stimulation consisted of three phases: 2 tactile stimulation phases and 1 kinesthetic stimulation phase. Tactile stimulation consisted in smooth and gently stroked in prone position over each region in the following sequence: from the top of the head to the neck 2) from the neck across the shoulders 3) from the upper back to the waist 4) from the thigh to the foot and both legs 5) from the shoulder to the hand to the shoulder on both arms. After first tactile stimulation phase, neonate was placed in a supine position and the kinesthetic stimulation was done. This phase was slow passive flexion and extension of limbs. Finally NBAS was administered at the end of treatment period (10 days) and results of first and second evaluations were compared together. The paired t-test was used for the comparison of data obtained. For all analyses, the significance level was 0.05 and confidence interval was 95%.

Results

As shown in table 1 and 2, neonates in both the treatment and the control groups were matched evenly for all parameters (gestational age, birth weight, birth length, head circumference at birth, gender, Apgar scores (1 and 5 min), prematurity or IUGR and motor behavior. The mean birth weight and gestational age for neonates were 2015 (±309.95) grams and 33.65 (±1.93) weeks respectively. According to the results (table 3 and 4), treatment group was more mature in motor subsystems (average of general tone, motor maturity, pull-to-sit, defensive, and activity level) and there was statistical significant difference between 2 groups (p-value= 0.000).

Table1. Sample's descriptive data and clinical results

Characteristics	Control group	Treatment group	P-value
Birth Weight	2051.50±305.963	1978.50±317.461	0.464
Head Circumference	31.400±2.149	31.100±1.846	0.639
Birth Length	44.725±2.899	44.775±4.124	0.965
Apgar 1st min	8.35±0.670	8.500±0.688	0.489
Apgar 5th min	9.35±0.670	9.600±0.502	0.190
gestational age	33.666±1.914	33.636±2.062	0.970

Table2. Comparison of motor behavior in treatment and control groups (Before study)

Parameter	Control group	Treatment group	p-Value
General Tone	2.95±0.6863	3.6±0.8825	0.13
Motor Maturity	3.4±0.5026	3.05±0.9445	0.152
Pull-to-Sit	2.8±0.5231	2.8±0.7677	1
Defensive	1.85±0.3663	2.05±8255	0.33
Activity Level	2.65±0.6708	3.2±0.6958	0.51

Table3. Comparison of motor behavior in treatment and control groups (After study)

Parameter	Control group	Treatment group	p-Value
General Tone	4.15±0.6708	5.25±0.7864	0.000
Motor Maturity	4.75±0.5501	5.05±0.7591	0. 16
Pull-to-Sit	4.10±0.7181	4.35±0.6708	0.26
Defensive	3.0±0.7947	4.05±0.8255	0.000
Activity Level	3.90±0.7181	4.55±0.5104	0.002

Table4. Comparison of motor in treatment and control groups (After study)

Parameter	Control group	Treatment group	p-Value
motor	3.98±0.3548	4.65±0.2502	0.000

Discussion

The effect of touch on growth, behavior, and development of LBW infants has been longly fascinated to researchers. Some studies have shown that stimulation may adversely affect physiologic parameters in neonates and produce tremors, apnea, and cyanosis (9) while others have shown no adverse effect on physiologic parameters (7, 10, 11). In present study physiologic parameters were not affected by the tactile kinesthetic stimulation.

The present study assessed the motor behavior of LBW neonates who were in Post-NICU. These data suggest that LBW neonates benefit from Tactile Kinesthetic Stimulation during their stay in hospital. A number of studies have shown improvement in the clinical measures related to weight gain, a reduction in the length of hospital stay, and maturity of behavior (5, 6, 7, 8) but there are few studies about neonate's motor behavior (6, 7).

Results of Field's study (6) are similar to results of present study. In this study, 20 preterm infants gave stimulation for 10 days and were compared with 20 control group infants. At the end of 10 days stimulation that is similar to intervention of this study, infants of treatment group more mature patterns in the motor behavior (P-Value=0.03). But the results of this study are in contrast with reports of Mathai (7). Her reports indicated that 10 days tactile kinesthetic stimulation does not effect on motor behavior of premature infants (P-Value = 0.42). Also she performed follow up until 40-42 weeks of pregnancy but there was no statistical significant difference between 2 groups (p-value= 0.06).

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