Original Research
Medical Journal of the Islamic Republic of Iran. Vol. 23, No. 3, November, 2009. pp. 148-153

Effect of tactile-kinesthetic stimulation on weight gaining of preterm infants

Ashraf Mohamadzadeh, MD.[1], Soheila Karbandi, Msc.[2], Esmaily Habibollah, PhD.[3], Basiry Mahdi, Msc.[4]

Center of Mashhad University of Medical Sciences, Neonatal Research Center NICU, Emamreza Hospital Mashhad, Iran.

Abstract

Background: The quality of life and standard of health care in a society is measured by its preterm infants' mortality rate. The popularity and credibility of alternative treatment such as touch therapy may be effective in preterm and low birth weight infants in order to increase their survival rate. The aim of this study was to determine the effect of touch intervention on the weight gain of preterm infants who were admitted to the Neonatal Intensive Care Unite(NICU).

Methods: This study was a randomized controlled trial performed in NICU of Emamreza hospital, Mashhad, Iran, from July 2007 to November 2007. There were two groups (the control group and the case group) and one response variable (weight gain). Infants in the control group received routine nursing care. Infants in the case group, in addition to the routine care, received stroking/passive limb movement therapy for three 15 minute sessions per day for a 10 day period. Then weight gaining was compared between the two groups.

Results: The weight gain data was analyzed by SPSS software. Over the 10 day study period, the case group gained significantly more weight compared to the control group ($p<0.001$).

Conclusion: The data suggest that stroking/passive limb movement can be an efficient and cost effective way of enhancing growth in stable preterm infants.

Keywords: Preterm infant, tactile-kinesthetic stimulation, touch, weight gain

Introduction

The sensation experienced in the intrauterine environment is ideal for normal growth and neurobehavioral development of the newborn [1]. Preterm infants require efficient and cost effective care to compensate for possible shortage of intrauterine development.

Staffs working in Neonatal Intensive Care Unite [NICU) searched for new ways to improve the developmental quality for newborn infants. Preterm infants must receive best biomedical care, as well as proper, psychological, and emotional support to enhance their growth [2].

One way of achieving this is the use of massage therapy. Massage therapy has been introduced at NICUs in order to facilitate weight gaining process when the preterm infants primary need to gain weight. This observation has been reported in the preterm infant massage study that was conducted in 2002 by Field TM [3].

Traditional infant massage incorporates tac-

1. **Corresponding author**, Neonatalogist, Professor, Neonatal Research Center of Mashhad University of Medical Sciences, Neonatal Research Center NICU, Emamreza Hospital Mashhad, Tel: +98511 8406876, +989153 146917, Fax: +98511 852531. Email: mohamadzadeha@mums. ac. ir
2. Master of Midwifery Educational Nursing of Mashhad University of Medical Sciences.
3. Biostatistician, Assistant Professor of Neonatal Research Center of Mashhad University of Medical Sciences.
4. Graduate Student, Educational Nursing.

[Downloaded from mjiri.iums.ac.ir on 2024-03-29]

tile stimulation. A number of studies have shown positive effects of this stimulation on preterm infants, and other studies have shown that stimulation may adversely affect physiological conditions in preterm infants and produce apnea [4].

In our study, we evaluated the effect of tactile-kinesthetic stimulation on weight gain in low birth weight infants.

Methods

This study was conducted during a 4 Month period, from July 2007 to November 2007, at the NICU of Neonatal Research Center of MUMS at Emamreza hospital. Forty preterm infants were the subjects of this study in a randomized controlled trial. The infants with the following criteria were selected: gestational age of 28 to 34 weeks, birth weight of 1000-1500 grams, breast milk being fed by tube, and age five days since birth.

Babies with congenital malformation, acute illnesses, heart rate (HR) of less than 100 and more than 200 beats/minute over 12 seconds for 3 times during the intervention, and arterial O2 saturation level of less than 90 over 30 seconds for 3 times during the intervention were excluded. After receiving the consents of parents, infants were randomly assigned to one of the two groups (control or case group).

Infants in the control group received the routine NICU nursing care. Infants in the case group, in addition to the routine NICU nursing care, received three 15 minute sessions of massage intervention each day. The massage started on day five after birth in order to allow time for physiological stabilization and to decrease the chance of an unfavorable outcome. Caloric intake was recorded from the hospital chart. The weight gain of preterm infants in two groups was controlled daily by digital scale. All preterm infants were considered medically stable and did not receive ventilator assistance. The massage protocol was similar to that reported by field study in 1986 [5].

Each infant in the case group received tactile kinesthetic stimulation for three 15 minute sessions in three consecutive hours begin approximately 30 minutes after the first feeding for 10 days in a row.

The stimulation sessions consisted of three standardized five minute phases. Tactile stimulation was given during the first and third phase and kinesthetic stimulation was given during the middle phase.

This study was approved by the Ethics Committee of MUMS and consent forms were received from all parents.

Phase I and Phase III: For the tactile stimulation, the infant was placed in a prone position. The researcher used the palms of his scrubbed and warmed hands on the infant's body while the baby was in the incubator. He gently stroked for five seconds, twelve times consecutively (totaling one minute), the following five regions of the infant's body:

From top of the forehead down the side of the face to the neck and back to the forehead; from back of the neck across the shoulders and back to the neck; from the upper back down to the waist and back up; from the thighs down to the ankles and back to the thighs; and finally, from the shoulders to the wrists and back to the shoulders.

Phase II: For the subsequent kinesthetic stimulation, the infant was placed in a supine position. This five minute phase contained five one-minute intervals and each interval included six passive flexion/extension movements in the right and left arm, the right and left leg, and the two legs together. The massage intervention was discontinued if the infant demonstrated any signs of physiological distress (HR ≤100 or ≥ 200 beats/minute for longer than 12 seconds or arterial O2 saturation levels <90% for longer than 30 seconds).

If the massage had to be discontinued due to changes in either the HR or the oxygen satura-

[Downloaded from mjiri.iums.ac.ir on 2024-03-29]

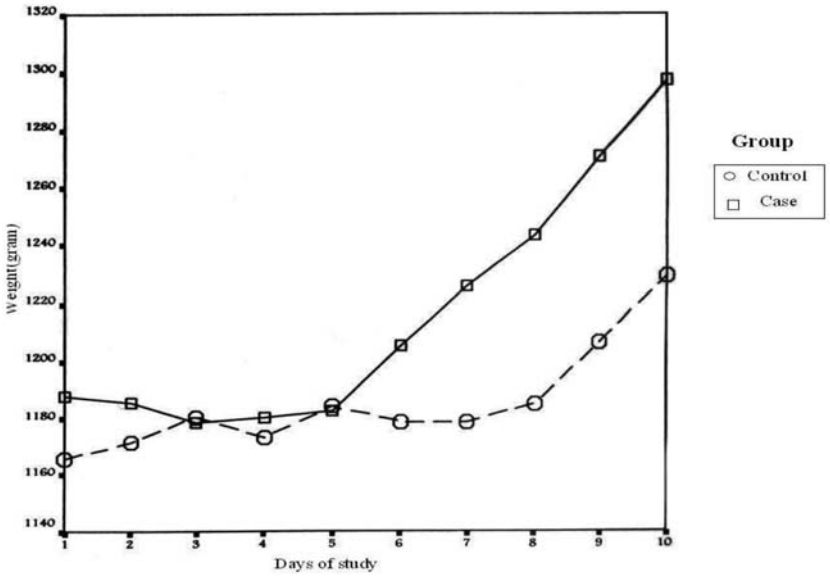


Fig. 1. Comparing mean weight gain between two groups

tion level, the researcher waited at least 30 minutes before instituting another massage session.

Results

From the 40 preterm infants that participated in this study, 17 preterm infants were excluded due to illnesses, early discharge, or the parent's unwillingness to continue with the study. Only 12 infants in the case group and 11 infants in the control group continued. The group did not differ on the matched variables of gestational age, birth weight, weight on day one of the study, 1 and 5 minute APGAR [Activity, Pulse, Grimace, Appearance, and Respiration), beginning of first feeding, gender, and fluid therapy. As shown in table 1, no significant differences were found between the two groups for these variables.

The t-test on mean caloric intake/kg/day revealed no significant differences between the

Variable	Case group Mean±SD	Control group Mean±SD	Result
Gestational age (WK)*	31.3±2.89	30.9±3.01	P= 0.632
Birth weight (gram)	1299±150.82	1321.5±171.17	P= 0.662
Apgar at 1	6.95±1.36	6.8±1.01	P= 0.49
Apgar at 5	7.55±1.19	7.7±1.17	P= 0.69
Weight in day one of study(gram)	1212 ± 180	1237 ± 201.3	P=0.681
Beginning of first feeding (hour)	59 ± 32.2	57.1 ± 32.5	P=0.858
Total Fluid intake (cc/kg/day)	115.7 ± 14.1	113 ± 20	P=0.725
Gender			
Male N (%)	12 (60)	11(55)	P=0.746

* Wk: week

Table 1. Characteristics of preterm infants in case and control groups

[Downloaded from mjiri.iums.ac.ir on 2024-03-29]

Variable	Case group Mean±SD	Control group Mean±SD	P value
Calories/kg/d*	69.5(18.9)	64.3(16.6)	NS**
Calories/d	102.5(26.1)	100.2(32.1)	NS
Daily weight gain (gram)	11.6 (3.8)	5.4(3.4)	< 0.001

* Day, ** Not Significant

Table 2: compare of mean weight gain and caloric intake between two groups

two groups. To assess group differences in the ratio of caloric intake/weight gain, results showed caloric intake was more in case group than control group but not significantly (Table 2).

The t-test on mean weight gain showed that infants who were massaged (case group) showed increased weight of 11.6 grams/day during the study, whereas the increased weight in the control group was only 5.4 grams/day and significantly fewer (P=0.0001). This is reflected in table 2.

Separate analysis of weight gain during the first and second half of the study (day 1-5 and 6-11 respectively) revealed a significant effect only in the second half (P<0.001) as it is reflected in Figure 1.

The results showed that weight gain increased following the massage therapy as it has been demonstrated in other studies.

Massaro and colleagues evaluated the effects of massage with or without kinesthetic stimulation on weight gain and length of hospital stay in the preterm infants. Results showed that for the infants with birth weight >1000g, average daily weight gain was increased in the case group compared to the control group [6]. The study also concluded that massage with kinesthetic stimulation is a relatively simple and inexpensive intervention that can improve weight gain in selected preterm infants and that length of hospital stay is not impacted by massage with or without kinesthetic stimulation.

Chang and Suing indicated that nurses can teach parents to administer massage therapy on their preterm infants, which also enhances parent-child attachment and interaction, and that the massage therapy procedure can be included in the premature infant care program in the future [7].

Sharon & Mimouni found that energy expenditure is significantly decreased by 5 days of massage therapy in metabolically and thermally stable preterm infants. This decrease in energy expenditure may be in part responsible for the enhanced growth caused by massage therapy [8].

Lee evaluated the effects of massage on weight, physiological parameters (vagal tone, heart rate, oxygen saturation] and behavioral responses. His result showed that massage therapy enhances optimal physiological responses and behavioral organization of preterm infants [9].

Miguel and colleague obtained the same results. They concluded that preterm infants receiving massage therapy exhibited greater weight gain, increased vagal tone, and gasteric motility during and immediately after treatment [10].

Mathai and his colleagues determined the effects of tactile kinesthetic stimulation on physiological parameters, physical growth, and behavioral development in preterm infants. Their results showed a weight gain of 4.29 grams/day more than control group which was statistically significant [11].

Feldman and his colleagues evaluated 57 healthy preterm infants that were assigned in three groups. Two groups received massage

[Downloaded from mjiri.iums.ac.ir on 2024-03-29]

therapy from their mothers or nurses and the third group was the control group. They showed that over the 10 day study period, the two treatment groups gained significantly more weight compared to the control group [12].

A Cochrane meta-analysis has shown an average greater weight gain of 5 grams/day than controls [13].

The mediating mechanisms for the greater weight gain of the stimulated infants cannot be determined from these data. Formula intake was not a significant factor because caloric consumption was equal in two groups.

Cassia Fogaça evaluated the salivary cortisol levels before and after the massage therapy on healthy infants. The results showed that there were reductions in the salivary cortisol level following the massage, thus reflecting possible adaptation of the hypothalamic-pituitary-adrenal axis. But it is unclear whether this plays an important role [14].

Others have not seen this reduction in the cortisol levels but have observed an enhancement in the activity of the sympathetic nervous system. This, in turn, has been positively related to better infant physiological and neurobehavioral conditions, maternal breastfeeding successes, and positive bonding between infants and the parents. The early, intimate, and physiological stabilizing benefit of skin-to-skin care seems to provide the optimal environment for preterm infants in intensive care [15].

In a study, with the purpose of investigating the neuroendocrine response in preterm infants to a pattern of tactile-kinesthetic stimulation, results showed that urine norepinephrine and epinephrine values increased significantly only in the stimulated babies. Urine dopamine and cortisol values increased in both groups, and serum growth hormone decreased in both groups. Individual differences in urine norepinephrine, epinephrine, dopamine, and cortisol values were highly stable across the 10 days of the study. The results of this study suggested that tactile kinesthetic stimulation of preterm infants had fairly specific effects on maturation and/or activity of the sympathetic nervous system. In addition, this study has defined catecholamine and cortisol secretion levels across various gestational ages in healthy preterm infants [16].

Conclusion

However, regardless of pinpointing the underlying mechanisms for the weight gain, it can be concluded that providing massage therapy for preterm infants was a very cost-effective form of facilitating their growth.

In our study, daily weight gain in the case group was 6 grams more than the control group. Mathai's study [11], showed a weight gaining of 4 grams/day more in case group compared to the control group and a Cochrane Meta-analysis [13] has shown an average greater weight gain of 5 grams/day in the case group compared to the control group.

Moreover, as shown in figure 1 of our study, beginning of weight gain in the case group was in day 5 instead of day 8 in the control group. But also weight gaining was significant in days 7, 8, 9, and 10 for the case group.

Therefore, tactile kinesthetic stimulation had direct effect on weight gaining in preterm infants.

Further studies are needed to evaluate the effect of massage in the extremely low birth weight (birth weight<1000 g] infants.

Acknowledgment

We would like to thank the research vice chancellor of Mashhad university science for supporting the budget of project, Miss Rana Amiri and nurses of NICU for their cooperation.

[Downloaded from mjiri.iums.ac.ir on 2024-03-29]

References

1. Butler SC, Als H. Neurobehavioral development of the preterm infant in neonatal-prenatal medicine. In: Fanaroff AA, Martin RJ, Walsh MC, editors. Neonatal- Prenatal medicine disease of fetus and infants. 8th ed. Mosby- Year Book Inc, 2006; pp. 1051.

2. Bond CH. positive touch and massage in the neonatal unit: a British approach, Elsevier science, Seminar Neonatal, 2002; 7: 477- 486.

3. Field TM. Preterm infant massage therapy studies: An American approach, Seminar Neonatal, 2002; 7: 487-4.

4. Gorski PA, Huxtington I, lewko witz D. Handling preterm infants in hospital - stimulating controversy about timing of stimulation. Clin Prenatal 1990; 17: 103-111.

5. Field TM, Schanbery SM, Scafidi F, Bauer CR. Tactile - Kinesthetic stimulation effect on preterm neonates. Pediatrics, 1986; 77:654-80.

6. Massaro AN, Hammad TA, Jazzo B, Aly H. Massage with kinesthetic stimulation improves weight gain in preterm infants. J Perinatol. 2009 May; 29(5):352-7. Epub 2009 Jan 15.

7. Change SM, Sung HC. Application of massage therapy in premature infant nursing care. Hu Li Za Zhi 2007, 59(1):78-82.

8. Sharon L, Mimouni F, Ashbel G, Dollberg SH. Energy Expenditure in growing preterm infants receiving massages Therapy. Journal of the American college of Nutrition 2007; 26(4):356-359.

9. Lee HK. The effect of infant massage on weight gain, physiological and behavioral responses in premature infants. Tgehan Kanho Hakhoe Chi 2005; 35(8): 1451-60.

10. Miguel A, Diego MA, Field T. Vagal Activity, Gasteric Motility and weight gain in massaged preterm infants. Science Direct the Journal of Pediatrics 2005; 147(1):50-52.

11. Mathai S, Fernandez A, Modkar J, Kanbur W. Effects of tactile kinesthetic stimulation in preterm. Indian Pediatrics 2001; 38:1091-1098.

12. Feber SG, Kaint J, Weller A, Feldman R. Massage therapy by mothers and trained professionals enhances weight gain in preterm infants. Early human Development 2002; 67:37-45.

13. Vickers A, Ohlsson A, Lacy JB, Horsley A. Massage for promoting growth and development of preterm and/ or low birth weight infants (Cochrane Review). In: The Cochrane library, 2, 2000.

14. Cassia Fogaça M, Carvalho WB, Ara?jo Peres C, Ivanoff LM; Hayashi L; Nascimento V. Salivary cortisol as an indicator of adrenocortical function in healthy infants, using massage therapy, Sao Paulo Med J 2005; 123(5).

15. Brown JV. Physiology of skin to skin contact for parents and their preterm infants. Clin Prenatal 2002; 31(2):287-98

16. Kuho CM. Tactile-Kinesthetic stimulation effects on sympathetic and adernocorticol function in preterm infants. Journal of Pediatric 1991; 119(3):434-40.

[Downloaded from mjiri.iums.ac.ir on 2024-03-29]