

Effect of Massage on Weight Gain in Premature Infants

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Abstract

Introduction:

After the introduction of surfactant, the survival rate of preterm neonates has increased significantly. This issue attracted much attention towards this fragile population. Many studies have demonstrated that massage plays a role in the weight gain of preterm infants. This study compares the effect of massage therapy on infants who were massaged by a nurse or their mother with those who did not receive massage therapy at all.

Materials and Methods:

This randomized clinical trial was conducted on three groups. (1) The infants who only received routine care and no massage (2), those who received massage by an expert nurse and (3) those who received massage by their mothers. We recorded daily weight gain, the length of hospital stay and fluid intake of infants. Kruskal Wallis test and SPSS software were used for statistical analysis.

Results:

The gestational age of infants ranged between 28 to 34 weeks. At the end of the fifth day the group massaged by a nurse had significantly more weight gain compared to the other two groups (6.5+1.5 in the nurse group, 4.6 +1 in the mother group and 3.7 +1.5 in the control group, $P=0.001$). Those who were massaged by their mothers also gained weight significantly more than the control group ($P=0.05$). There was no significant difference in the length of hospital stay among the understudy groups.

Conclusion:

Our study showed that the five-day massage therapy is a safe technique mothers can perform for stable preterm infants to facilitate weight gain in neonate.

Keywords:

Premature infant, Newborn, Massage therapy.

Introduction

At present, improved care of preterm infants especially with the use of surfactant has resulted in increased number of premature infants who survive

and specialists have focused on improving the growth and development of this population (1). According to the definition by the World Health Organization (WHO), an infant born prior to 37 weeks of gestation is considered preterm (2). Various studies have demonstrated that infants leaving the uterus too early can have many health complications (3).

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Whatever the fetus feels and experiences in the uterus environment are necessary and ideal for his physical growth and behavioral development (4). In case of premature birth, the preterm neonate loses the calm uterus environment that was full of sensory stimulations required for his growth and development and is placed in the NICU; a place full of light, noise and stress (4,5). Impairment in growth at early infancy, which is an important time for cellular hyperplasia and hypertrophy, can have permanent impacts on the future health of the infant. The restriction caused in growth of premature infants can stay with them till puberty (6). During the past 2 decades the abovementioned problems have compelled researchers to seek various methods to provide premature infants with complementary stimuli to help growth and development of newborns in the NICU (3). The supportive care and interventional stimulations aim to imitate the uterus environment and assist and facilitate infant's normal development (4-8). Various studies have demonstrated that massage therapy can improve weight gain, mineralization of bones, shorten the hospital stay and result in earlier discharge and tactile-kinesthetic responses in infants (5). In a study by field et al, 63 clinically stable preterm newborns with a mean gestational age of 30 weeks were randomly divided into 2 groups; massage and control. Newborns in the test group were massaged three times a day for 15 minutes for a total of 10 days. Test group infants gained significantly more weight daily compared to controls (32g versus 29 g). The same result was obtained in similar studies conducted by the same researchers (9,10).

The present study aimed to evaluate the effect of massage therapy by the mother on the weight gain of premature newborns and comparing it with the result of massage therapy by a trained nurse and controls during a 5-day period.

Materials and Methods

This randomized clinical trial was conducted on 28-34 week infants hospitalized at the NICU of Beheshti Hospital during 2009-2010. The inclusion criteria were: Gestational age of 28-34 weeks and complete oral feeding or gavage of 150 ml/kg/day. Infants in all study groups were fed with milk and did not receive fluid infusion. Infants older than 7 days were selected if they had stable vital signs. The exclusion criteria were: Important congenital disorders, congenital heart disease, gastrointestinal disorders and need for mechanical ventilation during massage therapy. The number of infants receiving nutritional supplementation of mother's milk was similar in all 3 groups. The number of breastfed or formula-fed infants was also similar in the 3 groups. All the study phases and consent forms provided by parents were approved by the Ethics Committee of Isfahan University of Medical Sciences. The study was thoroughly explained to the parents and written informed consent was obtained. A code was allocated to each infant qualified for the study. These codes were written on small pieces of paper and placed in a box. A person not aware of the study randomly drew pieces of paper out of the box and this way all infants were randomly divided into 3 groups. Each group consisted of 20 infants. The first group received massage therapy by their mothers, and the second group by a nurse. The 3rd group did not receive massage therapy and only routine care was given to them. Massage therapy was started on the first day of the study and continued for 5 consecutive days, each time for 5 minutes. The first session was one hour after the morning feeding, the second session was 30 minutes after the mid-day feeding, and the 3rd session was 45 minutes after the completion of the 2nd session. Each session consisted of 5 minutes of tactile stimulation. The infant would be placed in prone position. The

massage therapists would warm up their hands first and were quiet during therapy. Massaging was gentle using the ventral part of the fingers. The whole massage was divided into 5 sections of 1 minute each and each section to 6 fractions of 10 seconds each. In the first section, massage was started from the head to the posterior neck and back to the head. In the second and third sections, massage started from the posterior neck to the shoulders and back to the posterior neck. In the 4th section, massage started from the shoulders down to the buttocks and back to shoulders except for the vertebral area which was left untouched. The fifth section included simultaneous massage of both legs from the hip down to the soles and back. The sixth section included both hands from the shoulders to the wrists and back to shoulders simultaneously. The phases of each 5-minute session of massage included 5 times repeating of the 1 minute massage which contained head and neck massage for 10 seconds, 20 seconds shoulders massage, 10 seconds back massage, and 10 seconds massage of both legs. A special questionnaire was filled out daily for each infant containing daily weight, amount of fluid intake, number of defecations, medications, and amount of calories received (kcal/kg/d). Before initiation of study, the mothers and nurses who were going to massage the infants received necessary instructions and training. For accurate recording of information, a fulltime nurse was recruited to supervise the whole process.

Physiologic responses were controlled by measuring the heart rate and respiration rate per minute. In case of emergence of signs or symptoms of physiologic distress such as the heart rate over 200 beats/min, the massaging would be stopped for 15 seconds or until reaching the baseline values. A warning alert sound would warn the therapist about the presence of unfavorable physiologic responses.

Mothers received necessary information and training in this respect. The head nurse supervised the massaging by the mothers and nurses. Data were entered via SPSS version 15 software and one way analysis of variance (ANOVA) and Kruskal Wallis test were used for data analysis.

Results

A total of 60 infants 28 to 34 weeks were studied. The mean gestational age in the 3 groups of control, massage by the mother and massage by a nurse was 31 ± 2.4 , 30 ± 2.3 and 32 ± 2 , respectively. The mean percentage of weight gain is listed in Table 1. The mean percentage of weight gain in infants during the study days compared to day 1 in the group of massage by nurse was higher than in the other 2 groups ($P<0.001$). Between the other 2 groups, the massage by the mother group had 0.5% more weight gain compared to controls and this difference was also statistically significant ($P=0.04$). Comparing the mean weight gain in each day of study compared to the previous day, this rate was significantly higher in the massage by nurse group compared to the other groups ($P=0.0001$). Also the group of massage by mother had a significantly higher weight gain compared to controls ($P=0.04$). The mean hospital stay in the 3 groups was not significantly different ($P=0.1$).

According to one-way ANOVA test, mean percentage of weight gain in the massage by the nurses group was significantly higher than the other 2 groups. The remaining 2 groups had 0.5% difference which is the minimal significant difference. Mean number of defecations was significantly higher in the group of massage by nurse ($P=0.001$). No significant difference was observed between the other 2 groups in this regard. The mean percentage of fluid intake was significantly lower in the group of massage by nurse ($P=0.05$) but the other 2 groups

had no significant difference in this respect with each other. The Apgar score at 1 and 5 minutes for infants in different groups was not significantly different. Kruskal Wallis test demonstrated that educational level of mothers in the 3 groups was not significantly different from each other ($P=0.71$). Spearman's rank correlation

coefficient failed to find a significant association between education level of mothers and percentage of weight gain at different times in the massage by mother group ($P>0.05$). No complication occurred in any of the understudy groups and heart rate and respiration rate of infants remained normal.

Table 1: Comparison of the mean percentage of weight gain among the infants of 3 groups during the study period.

Percentage of weight gain	Massage by mother Mean±SD	Massage by nurse Mean±SD	Controls Mean±SD	P-value
Day 2 compared to day 1	1 (3.4)	1.4 (0.9)	0.9 (0.4)	0.03
Day 3 compared to day 2	2.1 (0.6)	2.8 (1.2)	1.8 (0.6)	0.001
Day 4 compared to day 3	3.3 (0.8)	4.4 (1.7)	2.8 (0.9)	<0.001
Day 5 compared to day 4	4.6 (1)	6.5 (2.5)	3.7 (1.5)	<0.001

Discussion

Dieter et al, in 2003 conducted a study on 32 premature infants. The newborns were randomly divided into 2 groups of test (massage) and controls. Since the previous 10 day studies had demonstrated that gaining weight usually starts from day 5 of intervention, the test group infants were massaged for 5 days. At the end of massage therapy, the test group gained 53% more weight compared to controls (3). Safety and efficacy of massage therapy for premature infants have been confirmed in several studies. Researchers have demonstrated that kinesthetic stimulation in infants by mothers improves the parent-child relationship. Massage therapy can also improve this relationship by facilitating the development of preterm newborn (12). Therefore, it was suggested that massaging be performed by the mother. Apart from the above mentioned benefits, if applicable, this can help in reducing the costs to a great extent because hiring a nurse to do the massage therapy would be expensive and time consuming. In a study by Ferber and colleagues 57 healthy preterm infants were divided into 3

groups. The first group only received supportive routine care; the second group was massaged by their mothers and the third group by a nurse. The intervention continued for 10 days. At the end of study period, both groups receiving massage therapy gained significantly more weight compared to the control group (10). Matthias and coworkers performed a study on 48 immature infants weighing 1 to 2 kg. Massage therapy was performed by a nurse from day 3 to day 8 and from day 8 on by the mother and continued until the infant was full-term. Weight gain in the group receiving massage therapy was 4.2 g per day more than the control group (13). In the literature review we found only one study evaluating the weight gain of premature infants receiving massage therapy only by their mothers or nurses. If massage therapy is effective, the adverse complications of premature birth will be compensated for to a great extent. If massage therapy is done by the mother, in spite of the resultant weight gain, the mother-child relationship will also become stronger. The high cost of NICU will

decrease and the need for hiring a trained nurse will be obviated.

Our study results, similar to the findings of several previous studies revealed that massage therapy can enhance weight gain of clinically stable preterm infants (11-13,17). In the present study, infants in the group of massage by nurse gained significantly more weight than the matched controls. At the end of 5-day study period, the massage by nurse group had significantly more weight gain compared to the other 2 groups. Infants in the group of massage by mother also gained significantly more weight than the controls. Different mechanisms have been proposed for the positive effects of massage therapy. For the first time, Field and colleagues during the feeding of preterm infants found that infants who had non-nutritive sucking gained 2.8 g more weight than others. Based on this finding, a mechanism was suggested stating that stimulation of proprioceptors present in the mouth has been the reason for this extra weight gain (11). In the mentioned study it was shown that stimulation of these receptors results in increased secretion of Gastrin, Insulin and Cholecystokinin. Thus, they concluded that stimulation of proprioceptors all over the body of infants may result in gaining more weight. Several studies were performed by the same researchers and others to test the accuracy of this theory. They all reported that massage therapy with the technique employed in our study enhances weight gain. In all these studies massage therapy with and without passive movement of limbs resulted in weight gain (11). According to the above mentioned studies although the immature infants can seem very fragile, some pressure has to be applied in order for the massage to be effective. This fact was also confirmed in the present study. This study showed that mean weight gain on day 1 was significantly greater among infants who

were massaged by a nurse. From day 2 on, infants massaged by the nurse had a significantly greater weight gain than those in the other 2 groups. Infants massaged by the mothers did not gain weight as much as those in the nurse group but from day 3 on had a significantly higher weight gain than controls. This finding is in accord with some other studies that confirm the ability of mothers to do the massage. However, a significant difference was found between infants massaged by the nurse and those massaged by their mothers in terms of weight gain. We believe this difference is due to the difference in the amount of pressure applied since mothers and nurses had the same technique and the maneuvers were exactly the same. Also, a trained technician supervised both nurses and mothers. Although the mechanism responsible for weight gain as the result of massage therapy is yet to be completely understood, it seems distant that the weight gain be due to increased calorie intake because Field and colleagues demonstrated that the infants who gained weight as the result of massage therapy did not have more calorie intake or were not storing more than others. The same results were obtained by studies conducted on preterm infants and also in animal model studies. Any weight gain as the result of massage therapy is due to the higher food conversion ratio (18). Another finding of the present study was fewer defecations in the nurse group compared to the other 2 which can further confirms the increase in food conversion ratio. This group even had less fluid intake compared to others. Some studies have shown that massage therapy can reduce the hospital stay (12). In our study and also in a study by Massaro et al, no significant difference was observed in the duration of hospital stay among the 3 groups. It should be mentioned that in our hospital system, hospital stay is not a good criterion to report because it is influenced by the medical and social status of infant

and is also based on the opinion of parents and judgment of physicians. Controlling these confounding factors is difficult in clinical trial settings (12). In our study, no significant difference was detected between the infants of the 3 groups in terms of their Apgar score at 0 and 5 minutes. Our study demonstrated that mothers can significantly enhance the weight gain of their newborns by massaging them, but in contrast to the findings of Ferber et al, (14), this weight gain in our study was not as much as the amount gained by infants massaged by a trained nurse. As mentioned earlier, this may be due to the lower amount of pressure applied by the mothers since they believe their newborns are too fragile. No complication occurred in our study and vital signs of infants were stable during the massage therapy. This study showed that massage therapy of preterm infants with gestational age over 28 weeks is a safe technique to improve their weight gain and mothers can learn and perform this effective procedure to enhance the weight gain of their newborns and decrease the costs at the same time. However, further investigations are required to improve the efficacy of massage therapy.

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