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Comparison of the Finger Feeding Method Versus Syringe Feeding Method in Supporting Sucking Skills of Preterm Babies

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Abstract

Aim: The aim of this study is to compare the efficiency of a new method called ''finger feeding'' with a well-known technique called syringe feeding for improving sucking skills and accelerating transition to breastfeeding in preterm infants.

Materials and Methods: Totally 70 babies were included in this prospective randomized controlled study. Finger feeding method was applied in Group 1 ($n=35$) and syringe feeding method was applied in Group 2 ($n=35$). The COMFORTneo scale (CnS), oxygen saturation, pulse, respiratory rate, body temperature, amount of breast milk taken, and vomiting data were recorded before and after both applications. Hospitalization period and time elapsed for complete transition from both methods to breastfeeding were also recorded.

Results: There was no statistical difference for birth weights, mean gestational age, and vital signs recorded before and after feeding between two groups. Predicted comfort and distress scores of Group 1 determined by the CnS were significantly lower than those of Group 2. This means that babies in the finger feeding group had better comfort than the those in Group 2 ($p=0.000$). Time passed for transition to breastfeeding was significantly shorter than that in Group 2 (19.4 ± 15.0 days versus 29.7 ± 10.2 days, $p=0.000$). Group 1 had lower amount of food leakage while feeding and their average weight gain at the end of 10th day was significantly higher (322.1 ± 82.3 g versus 252 ± 108.4 g, $p=0.004$). They also were discharged earlier than Group 2 (25.8 ± 17.4 days versus 35.9 ± 13.0 days, $p=0.001$).

Conclusion: Finger feeding method is an effective way for increasing sucking abilities, accelerating transition to breastfeeding, and shortens duration of hospitalization in preterm infants.

Keywords: finger, feeding, preterm, sucking, discharge

Introduction

Breast milk is accepted as the most suitable nutrition for infants because of its proven benefits for mother and infant health. The World Health Organization (WHO), American Academy of Pediatrics (AAP), American College of Obstetricians and Gynecologists (ACOG), The United States Preventive Services Task Force (USPSTF), and Turkish Neonatal Society (TNS) suggest that babies should be fed only with breast milk in the 6 months of their life and breastfeeding should be continued along with supportive feeding until the end of age 2 years.[1–4]

Breast milk is the ideal nutrition not only for term babies but for preterm infants as well. For maintaining optimal growth, preterm infants particularly need attention to enteral feeding during this period more than other in their entire lifetime. Preterm infants, especially early preterms, do not have enough body fat because they cannot take advantage of body mass storage during the last 3 months of pregnancy. In addition, they are much more sensitive to medical situations that increase their energy and food requirements such as infection, respiratory disorders, hypoxia, acidosis, and surgery.[5]

Breast milk has many extra benefits for preterm infants such as protection from infections, necrotizing enterocolitis, and retinopathy of prematurity. It also has positive effects on rapid transition to full enteral feeding and shortening the hospitalization period.[6,7] It also has positive effects on the

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neurodevelopment level of a baby.[8] Therefore, it is very important for a preterm infant to get breast milk in the early stages of their lives.[9–12] Preterm infants cannot coordinate breathing and sucking/swallowing because of physiological and neurological immaturity.[13] The lack of neurological maturity before the 34th week of pregnancy makes oral feeding difficult. Before this week, suction is so weak that a baby can aspirate food during an oral feeding attempt. Some alternative methods are used for preterm infants to get ready for breastfeeding until they can coordinate sucking and swallowing.[14,15] Bottle, spoon, syringe, cup, and finger feeding methods are generally used as an alternative to breastfeeding.[16]

Because of the breastfeeding difficulties, mothers of preterm infants have to face some handicaps resulting in lower breastfeeding rates.[3,17] In all circumstances, feeding of premature infants with breast milk is very important and the transition period of preterm infants from enteral feeding to breastfeeding must be managed carefully.[18] It is very important for babies in newborn intensive care units to achieve sucking abilities before discharge. When policies supporting breastfeeding are adopted, even the smallest preterm infant can successfully get breast milk.[19]

In this study, we aimed to compare the finger feeding method with syringe feeding method in terms of supporting sucking abilities in the early days of life.

Materials and Methods

The study was designed to be randomized, controlled, nonblinded, comparative, and descriptive. Preterm infants who were cared in a level 3 baby-friendly neonatal intensive care unit (NICU) between February and September 2019 were involved in this study. Only 30–35 weeks of gestational age clinically stable babies who were cared on room air were involved in the study. A sealed envelope system was used for randomization. When a newborn was accepted to the intensive care unit, parents were informed about the study. Parents who accepted to join the study selected an envelope to be involved in one of the two study groups.

By referencing similar studies, the power of the study was calculated using the G*Power 3.0.8 program. With an 80% power and 0.05 error probability ratio for ''score on readiness assessment,'' it was found to be suitable for working with 5 patients (total of 10 patients) in each group. In similar studies, it was suggested that 10–12% more patients should be included to avoid any problems while collecting data or ensuring participation.[20,21] Total number of participants was defined according to similar studies in the current literature and this way power of the study was increased. A total number of 70 babies (35 for each group) were included in this study to increase the power of the study.[21–23]

The ethic committee approval of the study was obtained by a decision no E.93846 by the ''Clinical Research Ethics Committee of Ege University Faculty of Medicine'' dated January 2, 2019. Families were informed about the study and informed consent forms were obtained.

All infants in this study were previously fed parenterally and/or with breast milk through a orogastric tube and they were all on full enteral feed at the initiation of the study.

Inclusion criteria

Babies who were

- at 30–35 weeks gestational age,
- followed on room air,
- clinically stable,
- previously fed with breast milk through orogastric tube, and parenterally, and
- had never used nipples or baby bottles were included.

Exclusion criteria

- Babies of families who refused to participate in the study,
- babies supported with mechanical ventilator,
- babies who were previously given nipples or baby bottle, and
- babies who have even a short period of breastfeeding before the study were excluded.

Daily enteral feeding amounts of all babies in this study were calculated in accordance with our clinical guidelines, which refers to TNS 2018 guidelines. Readiness to enteral feeding was evaluated according to functional sucking–swallowing coordination when cardiorespiratory signs of the babies were stabilized. In addition to this, actions showing readiness for feeding such as rooting reflex, touching mouth, and awareness were also considered. Oral feeding was tested with minimum amounts and increased as per sucking–swallowing effort, breathing–swallowing coordination, and gagging. The babies were fed orally as much as they can and remaining expressed milk from the calculated amount according to clinical guidelines was given by enteral way as standard procedure of the unit. One of two study methods was chosen in transition to oral feeding.[18]

Group 1 ($n = 35$) was composed of babies fed by the finger feeding method and Group 2 ($n = 35$) was composed of babies fed by the syringe feeding method. Babies in both groups were fed by their own NICU nurse for 20 minutes, four times a day using the specified method. Remaining expressed milk was given through an orogastric tube. During the application period, gauze was placed under the babies' chin to determine the amount of leakage. Gauzes were weighed and results were recorded as leakage after the application.

Scores for Neonatal Acute Physiology-Perinatal Extension-II (SNAPPE-II) of all babies were recorded. SNAPPE-II is an objective scoring system used to predict the mortality risk in NICU. It uses the data obtained from nine parameters (mean blood pressure, PO_2/FiO_2 ratio, lowest temperature [°C], serum pH, multiple seizures, urine output, birth weight, Apgar score, and being small for gestational age) during the first 12 hours of postnatal period.[24,25]

The COMFORT scale (CS) was created in 1992 by Ambuel et al.[26] to evaluate the distress of the babies who are supported by a mechanical ventilator in a pediatric intensive care unit. Six of the eight items of CS focus on behavior (alertness, calmness, respiratory response, movement, muscle tone, and facial expression) and the other two items focus on physiological signs (mean arterial pressure and heart rate). Van Dijk et al.[27] first revised CS in 2005 and named it ''the COMFORT Behavior Scale.'' As the scale was a tool for assessing pain and sedation in infants, physiological signs were not included in the scale. In 2009, Van Dijk et al.[28]

Table 1. Comparison of Demographic Characteristics of Two Study Groups

	Group 1 (finger feeding) (n = *35*)	*Group 2 (syringe feeding)* (n = *35*)	p
Gestational age (weeks), mean ± SD	31.7 ± 2.4	32.2 ± 1.7	0.715
Birth weight (g), mean ± SD	1804.5 ± 495.1	1803.6 ± 488.4	0.991
SNAPPE-II, median (min–max)	5 (0–41)	5 (0–33)	0.243
Apgar 1 minute, median (min–max)	7 (4–8)	7 (4–9)	0.160
Apgar 5 minutes, median (min–max)	8 (7–9)	8 (6–10)	0.331
Gender, *n* (%)			
Male	17 (48.6)	17 (48.6)	1.00
Female	18 (51.4)	18 (51.4)	

SD, standard deviation; SNAPPE-II, Score for Neonatal Acute Physiology Perinatal Extension-II.

renamed the scale as COMFORTneo scale (CnS) and secured the reliability and validity of the scale. In addition to defining comfort of the babies, the scale is an evaluation tool, which includes quantitative scales to help nurses to evaluate the pain and distress of the babies. The lowest score a baby can receive from the CnS is defined as 6 and the highest score is 30. Scores between 6 and 13 indicate that the baby is comfortable. Scores between 14 and 30 indicate that the baby has pain and distress and needs attempts to provide comfort.[29]

Gestational age, birth weight, Apgar scores at 1 and 5 minutes, daily weight gain, oxygen saturation before and after feeding, pulse rate, respiratory rate, body temperature, feeding amount (cc), vomiting/leakage after feeding, CnS score before and after each feeding period, and also time elapsed to fully breastfeeding and duration of hospitalization were recorded in the case report forms (CRFs). The CRFs were daily recorded and added to babies' charts by their caregiving nurses. Investigators then checked and finalized CRF data.

In our study, CnS scores were evaluated both by the caregiving nurse and a blinded neonatologist before and after feeding. All babies were supported by intermittent Kangaroo care and skin contact to mothers' breasts. Nipple and bottle usage were totally forbidden.

Finger feeding technique

The babies in the study group were fed during 20 minutes for four times a day by their nurse with the modified version of Canadian Pediatrician Jack Newman's ''Finger Feeding Method'' as explained hereunder.[30]

- Hands must be washed and nails must be kept short.
- Semisitting position in nurse's arms is the most position for the baby.
- A 5 Fr/36 inches (93 cm) feeding tube must be inserted inside a bottle through enlarged nipple area, the bottle is filled with expressed breast milk.
- End of the feeding tube must be fixed with a tape to the little finger and it must not pass the tip of the little finger.
- The baby's lips must be gently stimulated for encouraging the baby to open its mouth wide and the little finger must be inserted approximately 1.5 cm until feeling the hard palate.
- The pulp of the small finger must be facing the hard palate and the baby will begin sucking.
- If the lower lip is suck inwards, baby's chin must be pulled.
- Sucking and swallowing of the baby show the technique is working. If feeding is not fast enough, bottle may be raised slightly above the baby's head.

Syringe technique

In the control group, breast milk was dropped through a 1 or 2 cc syringe to the inner side of baby's cheek for four times a day during 20 minutes. Sucking–swallowing and breathing coordination were evaluated during the feeding period. At the end of the 20 minutes, remaining milk was given through an orogastric tube.

Weight gain at the end of day 10 was compared between groups. The same method then continued until full transition to breastfeeding. All babies were discharged fully breastfed.

Statistical analyses

Although the categorical variables were described with frequencies and percentages, descriptive statistics were calculated for continuous variables. The Shapiro–Wilk

Table 2. Comparison of Two Groups According to Study Outcomes

	Group 1 (finger feeding) (n = *35*) *Mean ± SD*	*Group 2 (syringe feeding)* (n = *35*) *Mean ± SD*	p
Transition time to full enteral feeding (days)	7.7 ± 5.0	9.0 ± 6.1	0.436
Starting time to specified oral feeding method (days)	14.1 ± 13.9	11.7 ± 6.9	0.773
The amount of remaining milk given through orogastric tube after feeds (cc)	15.3 ± 6.5	15.9 ± 3.0	0.203
Transition time to fully breastfeeding (days)	19.4 ± 15.0	29.7 ± 10.2	0.000
Duration of hospitalization (days)	25.8 ± 17.4	35.9 ± 13.0	0.001
Weight gain at 10th day of study (g)	322.1 ± 82.3	252 ± 108.4	0.004

SD, standard deviation.

Table 3. Comparison of Two Groups According to COMFORTneo Scale Scores Before and After Feeding

	Group 1 (finger feeding) (n = *35*) *Median (min–max)*	*Group 2 (syringe feeding)* (n = *35*) *Median (min–max)*	p
CnS before feeding	24 (12–38)	25 (17–28)	0.095
CnS after feeding	9 (5–17)	24 (10–28)	0.000
p	0.000	0.065	

CnS, COMFORTneo scale.

normality test was used to examine whether the continuous variables were distributed normally. Since the data were not normally distributed, Mann–Whitney *U* test was used to compare the median values of two independent groups. The Friedman test was used to analyze more than two dependent samples. The Fisher's exact test and the Pearson chi-square test were used for the analysis of categorical variables. A value of $p < 0.05$ was considered statistically significant. Statistical analyses were performed using IBM SPSS version 25.0 statistical software for personal computers.

Results

When CRFs from both groups were evaluated, the mean gestational age of the babies in Group 1 was 31.7 ± 2.4 weeks and the mean birth weight was 1804.5 ± 495.1 g. The mean gestational age of the babies in Group 2 was 32.2 ± 1.7 weeks and the mean birth weight was 1803.6 ± 488.4 g. Median (min–max) of SNAPPE-II scores of the babies in the finger feeding and syringe feeding groups was, respectively, 5 (0–41) and 5 (0–33) ($p = 0.243$). Also, when both groups were compared for gender ($p = 1.00$), gestational age ($p = 0.715$), birth weight ($p = 0.991$), and Apgar scores of 1 and 5 minutes ($p = 0.160$; $p = 0.331$), there was no statistical difference between the two groups (Table 1).

The mean time elapsed to breastfeeding for the babies in Group 1 was 19.4 ± 15.0 days and the mean hospitalization period was 25.8 ± 17.4 days. The same parameters for the babies in Group 2 were, respectively, 29.7 ± 10.2 and 35.9 ± 13.0 days. The mean time elapsed to breastfeeding ($p = 0.001$) and mean hospitalization time ($p = 0.001$) were significantly lower for the finger feeding group. There was no difference between the two groups in mean values for starting time to ($p = 0.773$) randomly specified oral feeding method and full transition to enteral feeding ($p = 0.436$). After 10 days of feeding with each method, the average weight gain was 322.1 ± 82.3 g for Group 1 and 252 ± 108.4 g for Group 2. The weight gains by the babies fed by the finger feeding method were significantly higher ($p = 0.004$; Table 2).

The median scores of the CnS for two groups before and after the feeding were significantly different in pain and distress scores ($p = 0.000$). There was no significant difference for prefeed CnS scores between the two groups (24 [12–38] for Group 1 versus 25 [17–28] for Group 2, $p = 0.095$). However, babies in Group 1 had lower median CnS scores after the feeds. Since lower CnS scores indicate higher comfort, we conclude that babies in Group 1 were more comfortable after the feeds (9 [5–17] for Group 1 versus 24 [10–28] for Group 2, $p = 0.000$) (Table 3).

There was no adverse effect nor any injury in both groups except those defined in the CS. There was not a significant difference between the two groups (15.3 ± 6.5 cc for Group 1 versus 15.9 ± 3.0 cc for Group 2, $p = 0.203$) for the remaining amount after feeding to be given by orogastric tube (Table 2).

In addition, when gauzes were weighed after the feeds, the calculated mean leakage amount was higher (2.2 ± 0.8 cc) in Group 2. The leakage in the finger feeding group was so negligible that it could not be given in the figure (Fig. 1).

Discussion

Effects of the finger feeding and syringe feeding methods on weight gain, transition time to breastfeeding, hospitalization period, and comfort levels for preterm babies in the transition period from gavage to oral feeding were evaluated in this

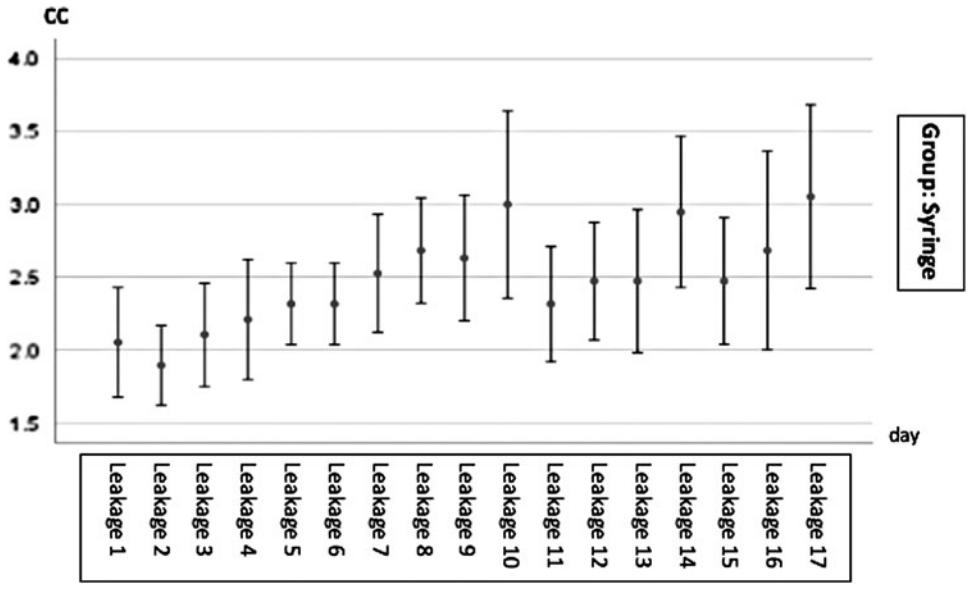

FIG. 1. Mean ± SD breast milk leakage amounts as cc per day during the study period. cc, cubic centimeters; SD, standard deviation.

study. Results showed that the finger feeding group had advantages over the syringe feeding group. Their weight gain was higher, transition time to breastfeeding was shorter, hospitalization time was shorter, and comfort levels were higher.

Breast milk plays a very important role in short- and long-term health of low-birth weight and preterm infants. Transition to breastfeeding in a shorter time is the aim in NICUs. Preterm infants cannot perform suction and swallowing functions in the correct order. Sucking, swallowing, and breathing-coordinated functions mature after the 32nd week of gestation. Therefore, the NICUs use parenteral and enteral feeding methods according to the gestational and postnatal age and clinical conditions to meet the needs of preterm infants and provide optimal growth. In these units, methods based on knowledge and scientific evidence are used to increase maternal milk supply by breast pumps in the early days and also to encourage breastfeeding.[18,31]

One of the most important steps in successful breastfeeding is avoiding the usage of artificial alternative techniques to breastfeeding while transitioning from enteral to oral feeding. Despite the fact that the finger feeding method is an artificial technique, it is recognized in the current literature as a physiological method facilitating transition to breastfeeding and also improves sucking and breathing coordination.[22,30] Oddy and Glenn[32] showed that correcting sucking technique of a baby by the finger feeding method may improve breastfeeding rates and the hospital discharge process. In Newman's study, babies fed by the finger feeding method had fewer signs of physiological stress, better comfort levels, and showed earlier development of sucking and swallowing functions.[30]

Babies supported with the finger feeding method can grip their mother's nipple earlier than other babies can and with the right technique as well. In the current literature, there is no study comparing the finger feeding and syringe feeding methods. In our study, the finger feeding method has been more successful than the syringe method in transition from gavage to breastfeeding. It has been a more efficient way of feeding because of lower leakage rates. It helped quicker weight gain and shortened the hospitalization period, and the comfort level of the babies was also higher than that of the infants in the injector fed group.

We try to encourage mothers to do Kangaroo care for their babies to increase the breastfeeding rates during transition from orogastric tube to breastfeeding. If the mothers cannot visit the clinic, the nurses feed the babies mostly with bottles and rarely with spoons and syringes as our previous unit policy. The result of this study encouraged our clinic for finger feeding and we now rarely use bottle feeding.

The strengths of this study are that it is a randomized controlled prospectively designed study that included a sufficient amount of similar gestational aged babies and analyzed short-term prognoses until discharge. The limitations of this study were lack of blinding as a nature of the study and that the data collection was done by different neonatal nurses.

Conclusion

We conclude that the finger feeding method is physiologically efficient in

- accelerating transition to oral intake,
- increasing sucking abilities of preterm infants,
- accelerating transition to breastfeeding, and
- increasing comfort levels of the babies.

The finger feeding method can be used as an alternative method for preterm and sick babies. Finger feeding is a safe method for preterm infants and can be recommended to accelerate transition to breastfeeding, to increase weight gain rate, and shorten the hospitalization period.

To see the long-term results, the families were also reached by phone to ask the breastfeeding duration within the first year, however, these data will only be completed by September 2020.

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