KANGAROO CARE at Birth for FULL TERM INFANTS

A Pilot Study

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ABSTRACT

Purpose: To determine whether breastfeeding behaviors, skin temperature, and blood glucose values could be influenced through the use of kangaroo care at the time of birth in healthy full term infants.

Method: Descriptive study with nine full term neonates given kangaroo care beginning within 1 minute of birth and continuing until completion of the first breastfeeding by mothers who intended to breastfeed. Infant skin temperature was taken at 1 and 5 minutes after birth and every 15 minutes thereafter. Blood glucose level was taken 60 minutes after birth, the time at which the infant latched onto the breast was recorded, and breastfeeding behaviors were observed during the first breastfeeding.

Results: Skin temperature rose during birth kangaroo care in eight of the nine infants, and temperature remained within neutral thermal zone for all infants. Blood glucose levels varied between 43 and 85 mg/dL for infants who had not already fed and between 43 and 118 mg/dL for those who had fed. All but one infant spontaneously crawled to and latched onto a breast by 74 minutes after birth. Physicians noted that mothers were distracted from episiotomy or laceration repair discomfort during birth kangaroo care.

Clinical Implications: In this institution, birth kangaroo care was integrated into routine delivery room care, with nurses noting no change in nursing workload. Nurses have noted observing the crawling, latching, and successful breastfeeding of most infants. Because of the results of this pilot study, birth kangaroo care has been implemented successfully with all women who wish to participate.

Key Words: Kangaroo care; Birth; Full term infants; Temperature.

The American Academy of Pediatrics (AAP) has recommended that "healthy infants should be placed and remain in direct skin-to-skin contact with their mothers immediately after delivery until the first feeding is accomplished" (Gartner et al., 2005, p. 498). In our hospital, however, the routine practice was to move the infant to a separate triage area for assessment and evaluation, a process that can take between 2 and 4 hours. To minimize the discrepancy between current practice and the AAP recommendation, a group of nurses wanted to change our separation protocol by beginning kangaroo care (KC) (skin-to-skin and chest-to-chest placement of the infant between maternal breasts) immediately after birth. Our plans raised concern among some nurses that infants might experience temperature loss, unacceptable blood glucose levels, or poor feeding performance if they were placed in KC immediately after birth. To address these concerns, a pilot study was done to examine infant temperature, blood glucose, and breastfeeding responses to KC beginning immediately after birth in a small group of infants before a widespread change to a new policy would be implemented. That pilot study is the focus of this article.

Kangaroo care which begins immediately after birth is called "birth kangaroo care" (BKC). When BKC occurs, pharyngeal suctioning, drying, and gestational age assessment are completed while the infant is in KC (Anderson, 1991). Eye care and bathing are delayed until 60 minutes after birth or until completion of the first feeding at breast, whichever is later. There is extensive evidence for KC with full term infants (Anderson, Chiu, Morrison, Burkhammer, & Ludington-Hoe, 2004). KC with full term infants began 30 years ago as "extra contact," which enhanced maternal-infant bonding and breastfeeding (Klaus et al., 1972), especially when started immediately after birth. BKC also promoted maternal-infant interactions, and it was found that infants fretted less and cried for shorter periods of time than infants not offered BKC (Christensson, Cabrera, Christensson, Uvnas-Moberg, & Winberg, 1995).

Skin Temperature and BKC

Some studies have been conducted concerning full term newborn infant temperatures and BKC. Fardig (1980) reported that more BKC infants than infants under radiant warmers had temperatures within neutral thermal zone by 21 and 45 minutes after birth. Two randomized control studies showed that infant axillary temperatures at 90 minutes after birth were higher (M = 37.1 °C) for BKC infants than for infants swaddled in a bassinet (M = 36.8 °C) (Christensson et al., 1992; Christensson et al., 1995). In a trial of 176 term newborns, axillary, thigh, back, and foot temperatures over the first 30 to 120 minutes after birth rose in infants given BKC. When infants held in BKC were compared with infants swaddled in maternal arms and swaddled and placed in a bassinet in a room away from mother, the BKC infants were the only ones with rising temperatures (Bystrova et al., 2003). One study that did not find better temperature with BKC was that of Villalon et al. (1992), who studied 47 healthy newborns who were given 4 hours of BKC. In that study, the BKC infants had temperatures no different at any time than infants who received routine maternity care under a radiant warmer.

When reviewing BKC studies on infant temperature, however, it is important to determine if BKC was actually carried out from birth or if infants were given care by nurses and then placed in KC. One study with infants who first received care (drying, eye care, banding, weighing, and foot-printing) under a radiant warmer and were then given KC for 15 minutes experienced a drop in temperature, but that drop was 0.4 °C less than the drop in temperature of infants who were swaddled and held for 2 to 5 minutes and then placed on the warmer (Gardner, 1979). Thus, the studies have not been unanimous in finding better thermal response of term infants to BKC, although optimal adaptation and special protection against hypothermia are believed to be provided by BKC (Gartner et al., 2005; Mazurek et al., 1999).

Blood Glucose and BKC

Blood glucose measurements have been studied with BKC, and similarly to the studies on skin temperature, the results have been mixed. In Mazurek et al.'s study (1999), infants had higher levels (M = 60 mg/dL) than swaddled infants who were beside their mothers (M = 52 mg/dL) or separated from their mothers (M = 49 mg/dL), which indicated that KC may protect against hypoglycemia. Another study of full term infants born by cesarean section and given paternal KC within minutes of birth had significantly higher glucose at 90 minutes and 24 hours after birth than swaddled infants in bassinets (Christensson, 1996). Durand et al. (1997) examined blood glucose differences between infants who had their first postbirth feeding in KC and infants who fed while swaddled, and they found no differences.

Movement Toward the Breast and BKC

Some studies have shown that term newborns placed skin-to-skin on the mother's abdomen immediately after birth spontaneously start moving toward the breasts and onto the nipple, but these behaviors are less likely to occur if infants are first placed under a radiant warmer (Righard & Alade, 1990) or if the mother had received analgesia (Ransjo-Arvidson et al., 2001). Initial movements toward the breasts and onto the nipple have been observed to increase initiation and exclusivity of breastfeeding (up to 6 months after birth) (Vaidya, Sharma, & Dhungel, 2005). Effectiveness of the first breastfeeding has been better in infants who receive BKC than in infants who do not receive BKC (Carfoot et al., 2003; Moore & Anderson, 2007).

Research Questions

Because BKC results have varied, the following research questions were posed:

1. What are term infants' temperatures during the first 90 minutes of BKC?
2. What are term infants' glucose values 60 minutes after birth while in BKC?

3. When do term infants latch after movement toward the breast while in BKC?
4. What are term infants' breastfeeding behaviors at the first feeding in BKC?

Study Design and Methods

Design

This was a descriptive design to gather data about infant temperature, blood glucose, latch, and breastfeeding behaviors while in BKC. All subjects were given at least 90 minutes of BKC, beginning within 1 minute of birth and continuing until the end of the first breastfeeding or until 90 minutes had passed, whichever was longer. The study was approved by neonatologists and obstetricians after informal discussion with each and by the hospital institutional review board. All parents gave signed consent.

Setting

Data were collected in a Level II, urban, private hospital with 2,100 births per year. Women were admitted to a labor/delivery/recovery room (LDR), where they remained for 90 to 120 minutes after birth before transfer to postpartum. In this setting, routine care involves the physician or midwife handing the infant to the nurse after wiping the face and cutting the cord. The infants then go to a radiant warmer for assessment, eye prophylaxis, and swaddling and are returned to the mothers for 60 minutes before transfer to a transition unit for completion of newborn care. For this study, the infants went directly to BKC after birth.

Sample

Subjects were introduced to the study by their physician or midwife during an antenatal visit. The research nurse was notified of the participating mother's admission to the LDR. Over 12 months, many women volunteered to participate, but only 10 were enrolled because of unit staffing needs and budget constraints. One woman then gave birth before the research nurse could get to the hospital. The final sample for this pilot study was 9. One research nurse, who is also a certified lactation consultant, collected data for 8 of 9 subjects; another nurse, also a certified lactation consultant, collected data on 1 subject.

Maternal inclusion criteria were normal spontaneous vaginal birth, singleton term infant (<37 weeks gestation), uncomplicated pregnancy, labor, and birth, and willingness to breastfeed. Maternal exclusion criteria were precipitous labor, dystocia, multiple birth, and cesarean birth. Infants had to be healthy and full term (by maternal dates). Infant exclusion criteria were any congenital anomaly, any orofacial anomaly that could preclude suckling at the breast, multiple birth, and obvious birth asphyxia as assessed by a 1-minute Apgar of three or less during BKC.

Instruments

Skin temperature was manually recorded from a Fisher Thermistor (Model # 15-078-1, Control Co., Friendswood, TX) and skin probe (Model 409A, Yellow Springs Instruments, Yuba, AZ) covered by a mylar patch (Vermed Inc., Bellows Falls, VT) 1 cm below the right costal margin at the midclavicular line. The thermistor autocalibrated each time it was turned on and is sensitive to ±0.01 °C. Blood glucose was assayed by Accucheck Advantage and Accucheck Comfort curve strips (Roche Diagnostics) on blood sampled by heel stick with a spring-loaded device (Tenderfoot, International Technidyne Corp., Edison, NY) using our hospital-approved procedure. Breastfeeding behaviors were measured using a system developed by a team of lactation consultants at this institution, which they named MEALS, an acronym for five behaviors: Mouth open, Ears wiggling, Areola covered, Lips flanged, and audible Swallowing. MEALS yields dichotomous scoring that reflects the presence or absence of each of the five behaviors (0 = behavior absent; 1 = behavior present). The total possible score is 5. A score of 1 or 2 reflects behaviors indicative of an ineffective feeding, 3 a fair feeding, and 4 or 5 an effective feeding. Formal validity and reliability for the MEALS have not been established, but our use for the past 10 years suggests that MEALS is an effective tool for helping lactation consultants and new parents evaluate latch and breastfeeding behaviors.

Physicians observed that mothers were distracted from episiotomy/laceration repair discomfort during BKC, and nurses reported that BKC caused no increase in nursing workload.

Procedure

Immediately after birth, the infant was placed skin-to-skin, belly-to-belly on the mother's abdomen. Infant head, trunk, and extremities were dried, a head cap and diaper were put on, 1-minute Apgar scores were assigned, the warmed-up temperature probe was attached, the infant was placed prone, and the infant's back was covered with a warmed blanket folded in half. Infant identification bands were then applied, and the 5-minute Apgar score was assigned. At 55 minutes after birth, one of the infant's feet was wrapped warmly for 5 minutes before a heel stick for blood glucose level. An adhesive bandage was applied and the foot re-

placed beneath the blanket. Infant movements toward the breast and the time at which the infant latched on were noted. If no spontaneous attempts to move toward the nipple occurred by 75 minutes, the infant was moved onto a breast. During the following 15 minutes, if no spontaneous attempt to latch onto the nipple occurred, the lactation consultant assisted the mother and infant to initiate breastfeeding. Once the infant was latched, MEALS was assessed. At the end of the first breastfeeding or at 90 minutes after birth, whichever was later, data collection and BKC ceased. Parenting behaviors were permitted ad lib throughout BKC, and many mothers cooed and talked to their infants, touched them with their fingertips, and occasionally stroked the infant's head and back.

Outcome Measures

Skin temperature was defined as the centigrade temperature displayed on the thermistor. Skin temperature was taken at 1, 5, 15, 30, 45, 60, 75, and 90 minutes after birth. Blood glucose was taken by heel stick 60 minutes after birth and was defined as the number of milligrams per deciliter displayed on the glucose monitor. Time at which the infant latched onto the breast was determined using the room clock. Breastfeeding behaviors were defined as the score achieved on the MEALS scoring system during the first breastfeeding.

Analysis Plan

Data from each subject were used to calculate group means, ranges, and percentages. Group mean temperature was based on individual temperature means recorded at 1 minute, 5 minutes, and then every 15 minutes throughout BKC.

Results

Infants were between 38 and 42 weeks' postmenstrual age with birth weights between 3,410 and 4,380 g (M = 3,676.11, SD = 372.73). One- and 5-minute Apgar scores were between 8 and 10. All births were attended by physicians or midwives. Two mothers had epidural anesthesia, 1 had pudendal anesthesia, and the other 6 had no anesthesia. Perineal lacerations occurred in 7 subjects, including 2 women who had midline episiotomies. No maternal or infant complications occurred. Fathers were in attendance for all births.

Temperature

Temperature data are displayed in Table 1. During BKC, eight of nine infants demonstrated temperature increases that ranged from 0.4° C to 1.5 °C. One infant's temperature dropped from 38.0 °C at 30 minutes after birth to 37.3 °C at 75 minutes after birth. Nonetheless, no infants became hypothermic during BKC. For eight of nine infants, group mean temperature climbed every 15 minutes until 60

TABLE 1. *Temperature Values, Blood Glucose Values, and Latch Times for All Subjects*

	Temperature (°C)								Blood glucose at 60 min	Time of successful latch (min)
Subject #	1 min	5 min	15 min	30 min	45 min	60 min	75 min	90 min		
Subject 1	36.60	36.60	36.60	36.80	37.10	36.80	37.20	37.80	59	74
Subject 2	36.40	36.90	37.10	38.10	38.40	38.40	38.00	37.60	85	89
Subject 3	36.60	36.70	37.20	37.60	37.90	38.10	37.90	37.70	118	74
Subject 5	37.70	37.70	37.80	38.00	37.70	37.50	37.30	Unavailable	61	14
Subject 6	37.20	37.10	37.20	37.30	37.80	37.50	37.60	37.80	49	18
Subject 7	36.40	37.70	36.80	37.20	36.90	37.20	37.80	37.80	Refused	60
Subject 8	36.40	36.70	36.90	37.50	37.80	37.70	37.80	37.90	43	65
Subject 9	36.40	36.90	37.20	37.30	37.70	36.90	37.10	37.20	63	22
Subject 10	36.40	36.90	37.30	37.20	37.60	37.60	37.80	37.60	43	65
M	**36.68**	**37.02**	**37.12**	**37.44**	**37.66**	**37.52**	**37.61**	**37.68**	**65.13**	**53.44**
SD	**0.46**	**0.41**	**0.34**	**0.41**	**0.44**	**0.52**	**0.33**	**0.22**	**25.32**	**27.88**

minutes after birth; a decrease of 0.14 °C then occurred, followed by an increase until temperature was 1.0 °C above the beginning group mean temperature.

Blood Glucose

Blood glucose results are displayed in Table 1. One mother refused the blood glucose procedure but continued in all other aspects of the study. The group's mean blood glucose level was 65.13 mg/dL (*SD* = 25.32). Three infants had gone to breast at 38 to 46 minutes after birth before the 60-minute glucose test. Mean blood glucose for these three infants was 57.66 mg/dL (*SD* = 7.57). The remaining five infants who had not fed had a mean of 69.60 mg/dL. This higher value may have been caused by unusually elevated levels in two subjects (85 mg/dL and 118 mg/dL). Blood glucose varied between 43 and 85 mg/dL for infants who had not fed and between 43 and 118 mg/dL for those who had fed before the 60-minute blood glucose test. Behavioral responses to the heel stick were also noted: one infant only grimaced during the procedure, three had brief cries that resolved in less than 15 seconds, and two cried robustly for 15 seconds.

Time of Latch

Eight of nine infants independently moved from the mother's abdomen to the breast and latched between 22 and 74 minutes after birth (*M* = 53.44 minutes; *SD* = 27.88 minutes) (Table 1). Two infants latched at 74 minutes after birth; one was moved to the breast at 75 minutes and latched on at 89 minutes.

Breastfeeding Behaviors

The group mean MEALS score was 4.56 (*SD* = 1.33) out of a possible 5. Eight of nine infants scored 5; one infant scored 1. At 75 minutes after birth, the low-scoring infant was moved onto a breast and latched at 89 minutes after birth but did not breastfeed until at least 1 hour after data collection ceased.

Additional Observations

Physicians, nurses, and mothers were informally asked their opinion of BKC. Physicians expressed pleasure with their impression that BKC seemed to distract women from pain incurred by episiotomy repair. Nurses reported surprise at how easily BKC was accomplished and uniformly commented that BKC did not increase nursing workload. All mothers reported that BKC was a positive experience. During routine 2-week follow-up phone calls, all mothers reported continued exclusive provision of mother's own milk.

Discussion

This pilot study found that healthy term infants placed in BKC within 1 minute of birth had temperatures that rose during BKC, that blood glucose levels were satisfactory for infants who had not fed before the glucose test at 60 minutes after birth, and that eight of nine infants spontaneously and independently moved to a breast and latched, obtaining optimal breastfeeding behavior scores. The one infant who did not move to a breast obtained a score of 1 (the only observed breastfeeding behavior was "mouth open"). This was a pilot study with a small sample; studies with larger populations should be encouraged.

Temperature increases reported here did not require nursing intervention and hypothermia did not occur. These temperature findings are similar to those in previous trials of BKC in term infants (Bystrova et al., 2003; Christensson et al., 1992, 1995; Mazurek et al., 1999) and to a thermogram study that showed heating of the entire infant's body (peripheral and trunk) during BKC (Christidis et al., 2003) rather than just the trunk, as occurs under a radiant warmer.

Blood glucose levels for all infants were within normal limits, which supported previous findings (Christensson, 1996; Durand et al., 1997; Mazurek et al., 1999) and Cochrane meta-analysis results (Anderson, Moore, Hepworth, & Bergman, 2003) that showed that hypoglycemia does not occur during BKC. Movement toward the breast in the infants was similar to findings of others (Matthiesen, Ransjo-Arvidson, Nissen, & Uvnas-Moberg, 2001; Ransjo-Arvidson et al., 2001), and the time of latch for most of our infants was consistent with those of Righard and Alade (1990), in which infants spontaneously latched about 50 minutes after birth. The MEALS scores obtained by the infants may reflect effective breastfeeding, possibly because of enhanced milk odor perception by the infants because of BKC (Mizuno, Mizuno, Shonohara, & Noda, 2004). Because studies of BKC's effects on breastfeeding "success" and effectiveness are only beginning to emerge (Carfoot, Williamson, & Dickson, 2003; Moore & Anderson, 2007), the data here provide additional evidence that BKC may positively impact breastfeeding effectiveness. However, our data need to be cautiously considered because the psychometric properties of the MEALS scoring system have not been established. Concurrent validation of the MEALS with other established breastfeeding effectiveness tools is needed. Nurses reported surprise at how easily

In this study, all infants using BKC maintained temperatures within neutral thermal zone, eight of the nine infants' temperatures rose during BKC, and all infants had normal blood glucose values at 60 minutes after birth.

Birth Kangaroo Care Procedure

- Explain to laboring women about the concept of BKC and its benefits for mothers and newborns.
- Immediately place infant on a warm blanket on mother's abdomen and allow to rest until the cord is clamped.
- Dry the infant and suction as needed while on the mother's abdomen.
- Remove the wet blanket. Infant is now skin-to-skin (BKC).
- Put on a head cap and diaper. Cover the infant's back with a clean warm blanket folded in half. Place ID bands.
- Delay infant's eye treatment and injections until after the first feeding at breast while infant is still in BKC.
- Monitor infant's skin temperature every 15 to 30 minutes to be certain that temperature remains within clinically acceptable range.
- Allow infant to spontaneously move toward the breast and latch onto a nipple. Infant may lunge at nipple two to three times before latching. This may take up to 75 minutes but occurs in most infants.
- Provide first breastfeeding support to the mother.
- Anticipate that BKC will not increase nursing workload and that episiotomy or laceration repair discomfort may be minimized.

BKC was accomplished and that the practice did not increase their workload.

An unexpected result of the study was that physicians commented that BKC seemed to distract mothers from discomfort during perineal repair, although the repairs preceded actual breastfeeding. Decreased maternal discomfort is possible because KC has been shown to comfort mothers (Roller, 2005) and decrease hypothalamic-pituitary-adrenal axis reactivity to painful and/or stressful events (Morelius, Theodorsson, & Nelson, 2005). Furthermore, when the infant is placed on the mother's skin, the pleasing touch releases endogenous opioids in the mother (Weller & Feldman, 2003). Endogenous opioids reduce pain perception. Thus, KC may reduce maternal pain as it does infant pain (Gray, Watts, & Blass, 2000). Delaying BKC until episiotomy repair is complete may be unnecessary, and BKC may actually facilitate repair, but BKC's use in this way needs to be tested.

A limitation of the pilot study is the small, nonrepresentative sample size. Future directional hypotheses of the effect of BKC on time of latch and effectiveness of the first feeding need to be tested before clinical outcomes can be postulated with assurance. Our data and those of randomized controlled trials (Christensson et al., 1992; Moore & Anderson, 2007) suggest that BKC is safe. Future studies evaluating outcomes during clinical implementation using translational methods are needed to complement limited existing literature, which suggests that there is less stress and better behavioral organization in term infants who receive KC soon after birth (Ferber & Makhoul, 2004).

Clinical Implications

Having data that clearly showed no hypothermia and blood glucose values within clinically acceptable levels provided the evidence of the safety of BKC that nurses wanted before changing practice. The data showing that these infants spontaneously latched and had a positive breastfeeding experience join with current recommendations that BKC be used in the delivery room and continued until the first breastfeeding has finished (Dabrowski, 2007). The nurses in our institution found that BKC did not increase nursing workload, which could support wider use of BKC. This study showed that infant temperatures and blood glucose levels were clinically acceptable in all infants. Spontaneous breastfeeding behaviors also were demonstrated by infants and facilitated the first feeding at breast. Because the results were based on pilot work, generalization to a larger sample or to infants in other settings is premature until confirmed by additional randomized controlled trials of BKC.

The study reported here has led to changing our practice of separating mothers and babies. Nursing staff's exposure to the study has led to at least 30% of mother-infant dyads being routinely placed in BKC. Staff nurses also have become more interested in nursing research and are volunteering to be involved in studies. Evidence-based practice has taken on new meaning, and bedside nurses are inquiring about the science supporting routine practices. Nurses who were formerly disinterested or even frightened of research now want to make it a part of practice. ✣

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