Skin-to-Skin Contact May Reduce Pain in Preterm Neonates

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May 1, 2008 — Skin-to-skin contact to reduce pain in preterm neonates has been shown to be effective in infants from 28 weeks of gestation through term, according to the results of a crossover trial reported in the April 23 Online First issue of *BMC Pediatrics*.

"Skin-to-skin contact, or kangaroo mother care (KMC) has been shown to be efficacious in diminishing pain response to heel lance in full term and moderately preterm neonates," write Celeste Johnston, DEd, RN, from McGill University School of Nursing in Montreal, Quebec, Canada, and colleagues. "The purpose of this study was to determine if KMC would also be efficacious in very preterm neonates."

At 3 level III neonatal intensive care units in Canada, 61 preterm neonates between 28 0/7 and 31 6/7 weeks of gestational age were enrolled in a single-blind, randomized, crossover design trial. In the experimental condition, the infant was held in KMC for 15 minutes before and during the heel lance procedure, whereas in the control condition, the infant was in a prone position swaddled in a blanket in the incubator.

The main endpoint was the Premature Infant Pain Profile (PIPP) in 30-second blocks from heel lance. PIPP includes 3 facial actions, maximal heart rate, and minimal oxygen saturation levels from baseline. The secondary endpoint was time to recovery, defined as return of heart rate to baseline. During heel lance, continuous video, heart rate, and oxygen saturation monitoring were recorded with event markers, and these were analyzed later. Statistical significance was determined with repeated-measures analysis of variance.

In the KMC condition, PIPP scores at 90 seconds after lance were significantly lower (8.871; 95% confidence interval [CI], 7.852 - 9.889) vs the control condition (10.677; 95% CI, 9.563 - 11.792; $P < .001$). At 30, 60, and 120 seconds, mean differences ranging from 1.2 to 1.8 favored the KMC condition, but these were not significant.

Time to recovery in the KMC condition was significantly shorter, by approximately 1 minute (123 seconds; 95% CI, 103 - 142 vs 193 seconds; 95% CI, 158 - 227). For all time points, facial actions were highly significantly lower in the KMC condition, reaching a 2-fold difference by 120 seconds after lance. Heart rate was also significantly lower in the KMC condition across the first 90 seconds.

Limitations of this study include inability to blind the person conducting the heel lance procedure.

"Very preterm neonates appear to have endogenous mechanisms elicited through skin-to-skin maternal contact that decrease pain response, but not as powerfully as in older preterm neonates," the study authors write. "The shorter recovery time in KMC is clinically important in helping maintain homeostasis."

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Clinical Context

KMC consisting of skin-to-skin maternal contact with the infant has been shown to reduce pain in full-term and preterm infants of 32 to 36 weeks of gestation with use of behavioral and physiologic measurements. In very preterm infants, heel lance and intravenous line insertion are sources of pain that can be addressed with use of sucrose or nonnutritive sucking. However, KMC has not been tested in very preterm infants as a method to reduce pain response.

This is a single-blind crossover trial to examine the effect of KMC vs the usual incubator condition in decreasing pain response to routine heel lance in infants younger than 32 weeks of gestation.

Study Highlights

- Included were infants born between $28^{0/7}$ and $31^{6/7}$ completed weeks of postmenstrual age determined by ultrasound examination at 16 weeks, with Apgar scores of more than 6 at 5 minutes within 10 days of birth,

breathing unassisted, with no major congenital anomalies, no ventricular hemorrhage, and no analgesic medication or surgery within 48 hours.

- Included were infants born and admitted or transferred to level III units, and their mothers had to be willing to hold them in the KMC position.
- Infants were randomized to the KMC or incubator condition, with a minimum of 24 hours and a maximum of 14 days between conditions.
- In the KMC condition, the infant was held upright at an angle of 60 degrees between the mother's breasts, providing maximal skin-to-skin contact between the baby and the mother. A blanket and the mother's clothing were then placed over the infant's back and tucked under each side of the mother.
- The infant remained in this condition for 15 minutes before the heel lance.
- Mothers were asked to keep their hands clasped behind the infant's back and to refrain from touching the infant's head with her face.
- The mother was permitted to speak to the infant, however.
- In the control (incubator) condition, the baby was in the incubator in a prone position swaddled with a blanket for at least 15 minutes before the heel lance.
- The heel lance consisted of heel warming, swabbing, and lancing with use of a spring-loaded lancet and application of an adhesive bandage.
- The instant of lancing was the point at which changes from baseline were determined and analyzed in 30-second blocks.
- There was continuous video recording and pulse oximeter monitoring.
- Primary outcome was the PIPP, a composite of physiologic and behavioral (face action) indicators and scores.
- The PIPP was selected because it accounted for differential baseline conditions, as the KMC condition was associated with greater likelihood of sleep.
- Physiologic scores were calculated with use of heart rate and oxygen saturation from baseline.
- Facial actions were brow bulge, eye squeeze, and nasolabial furrow and were scored by blinded research assistants according to the neonatal Facial Coding System on a second-to-second basis, with video recordings synchronously timed with the physiologic measures.
- The study investigators controlled for severity of illness.
- 125 infants met inclusion criteria, and 61 participated.
- Mean age was 30.5 weeks, birth weight was 1421 g, and 5-minute Apgar score was 8.2.
- Order of condition, postnatal age, and weight had no effect on the pain score.

- 31 infants underwent the KMC condition before heel lance, and their behavioral state was different from the incubator condition, with 60% in quiet sleep vs 30%.
- Mean PIPP scores were significantly lower in the KMC condition at 30 and 60 seconds after heel lance.
- By 90 seconds after heel lance, the difference was significant at 8.87 vs 10.7 for the incubator condition.
- The differences in scores were between 1.1 and 1.8 in the first three 30-second blocks of time after the heel lance (of a total possible score of 21).
- Time to return to baseline heart rate was significantly shorter at 123 seconds for the KMC vs 193 seconds for the incubator condition.
- Facial actions were significantly lower in the KMC condition, and average heart rate was significantly lower at 30, 60, and 90 seconds, with oxygen saturation significantly higher at 60 and 90 seconds.
- The authors concluded that maternal contact by KMC decreased pain response in very preterm infants and improved recovery time.

Pearls for Practice

- The KMC vs the incubator condition is associated with reduced pain response to heel lance in very preterm infants.
- The KMC condition is associated with faster recovery time, lower facial action, lower heart rate, and higher oxygen saturation vs the incubator condition in very preterm infants.