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Effects of kangaroo care during painful procedures in preterm infants: a review

Os efeitos da posição canguru em resposta aos procedimentos dolorosos em recém-nascidos pré-termo: uma revisão da literatura

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ABSTRACT

Although low-birth neonates are acknowledged to experience pain, many routine procedures continue to be conducted without proper pharmacological or non-pharmacological analgesia. Kangaroo care is a low-cost strategy that can be used in the preterm newborn. Mothers should be encouraged to use this easy-to-perform method, which is feasible both before and during neonatal units' invasive procedures, therefore contributing to pain reduction.

Keywords: Preterm; Pain; Humanization of assistance; Breast feeding; Analgesia

INTRODUCTION

Technological and scientific advances in neonatal units (NU) support premature low-birth infants' survival.[1] Premature neonates (PN) usually require NU care, where they spend their first weeks of life and often undergo painful routine procedures[2-5] such as endotracheal intubation, heel punctures, venous and arterial catheterization in addition to nasal, tracheal and gastric suctions.[2]

Due to the immaturity of their nervous system, PN are highly sensitive to pain.[3] Exposure to painful stimulation during early central nervous system development can lead to behavioral changes and areas of reduced brain sensitivity.[6] Although it is acknowledged that low-birth neonates are able to experience pain, many routine procedures continue to be carried without proper pharmacological or non-pharmacological analgesia.[2]

Pain control during painful procedures in neonates is still limited.[6] However, painful procedures in PN should be minimized and performed with frequent use of analgesia when necessary.[2] According to Johnston et al.,[5] the effects of topical anesthesia in extreme preterm neonates are not known, and repeated use of sucrose requires additional investigation to determine safety and effectiveness, especially in very-low–birth-weight children who are a few days old. However, non-nutritive suction has shown significant beneficial effects in extremely premature neonates.

Breastfeeding during painful procedures was shown to be effective for pain control in term-born newborns (TBN). However, breastfeeding is not always feasible in PN. Therefore, for this population, skin contact with the mother in a kangaroo position appears to be an effective way to improve the response to pain in PN, allowing the mother an opportunity to soothe her

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child during painful procedures.[5]

The Brazilian Ministry of Health defines kangaroo care as a type of neonatal assistance implying early progressive skin contact between a mother and a low-birth-weight neonate, for however long both consider it to be pleasant, thereby providing additional parental involvement in the child's care. The kangaroo position itself consists in maintaining the lightly dressed low-birth newborn in a prone vertical position against the adult's chest.[7]

The already known and assessed advantages of this method are increasing the mother-child connection, avoiding long periods without sensitive stimulation, stimulating breastfeeding, increasing parental competence and confidence in handling their baby, providing better thermal control, reducing hospital infection and hospital length of stay and promoting analgesic effects.[5,8,9] Mother-child relationship effects were studied in animals. Champagne et al.[10] have shown that rats receiving more licks and care during their first 6 days of life showed more cerebral plasticity in adult life, e.g. as shown by longer dendrite formations. Previously, in 2003, this group had described the post-partum behavior of female rats; these animals were shown to lick and care for their puppies more between the third and eighth days post-partum ($p < 0.01$) than between the ninth and tenth days. This mother-puppy contact was concluded to show the quality of maternal care and to regulate the neonate's responses to stressful situations.[11]

Pain assessment forms

Pain assessment in PN undergoing painful procedures in the NU can be based on the analysis of facial mimics, the PIPP (Premature Infant Pain Profile) scale and on physiological indicators (heart rate, respiratory rate, $SatO_2$).[5,12-17] Kostandy et al.[18] evaluated pain only, observing the behavioral state using the ABSS (Anderson Behavioral State Scoring System) scale. Ferber & Makhoul[19] assessed pain using the NIDCAP (Newborn Individualized Developmental Care and Assessment Program) scale. These scales are well described in the literature to be both sensitive and specific for this type of assessment.[20-26]

When and how long should kangaroo care be performed for non-pharmacological pain relief?

The effective time of kangaroo care on pain relief in PN has not yet been defined. However, Kostandy et al.[18] state that for acute procedures, kangaroo care appears to reduce the response to pain. Akcan, Yigit & Atici[15] highlight that starting kangaroo care thirty minutes before an invasive procedure and maintaining it for an additional ten minutes after the end of an invasive procedure can be effective for reducing the response to pain during any invasive procedure in PN.

Kangaroo care as a non-pharmacological pain relief procedure

Non-pharmacological interventions have analgesic effects during painful procedures conducted in the intensive care of PN. Based on the abovementioned, kangaroo care appears to contribute to this aim, as it calms the child, reduces the level of stress, behavioral signs of discomfort, and is associated with reduced crying in response to pain.

According to Freire, Garcia & Lamy,[12] a possible explanation for the effects of kangaroo care on pain reduction would be the behavioral changes provided by skin contact with the mother's chest, which stimulate deep sleep and thermoregulation. Pain response is apparently reduced in deeply sleeping PN.[18] Other significant factors to which kangaroo care appears to contribute include the activation of the autonomic system, as evidenced by a reduced heart rate, and the activation of the endogenous opioid system,[16] which mediate the physiological response during painful PN procedures.

According to Kostandy et al.,[18] kangaroo care analgesic effects are related to the blockade of the transmission of nociceptive stimuli via afferent fibers or the inhibition of descending fibers. Continued tactile stimulation offered by kangaroo care appears to be related to activation of the pain inhibition system via endogenous system modulation. Maintaining this position for twenty minutes changes the baby's blood cortisol levels and allows for the release of beta-endorphins, which reduce stress.[18] Additionally, the maternal contact promotes cortical pain center activation. However, according to Johnston et al.,[13] in extremely PN, endogenous mechanism activation is not as fast and potent as in older babies or adults.

Tactile and olfactory systems are the first to develop in intra-uterine life. Kangaroo care appears to contribute to providing comfort to the baby, as in contact with the mother, because the infant is able to recognize her scent as is the case with to breast milk.[14] Therefore, perceiving the mother's scent appears to be related to pain control in PN.[13]

Other non-pharmacological pain-relief methods

Freire, Garcia & Lamy[12] show that the use of glucose solution can also be considered as an effective non-pharmacological method, as its administration was shown to reduce behavioral indicators when compared to the control group patients, who were maintained in the incubator.

According to Johnston et al.,[5] maternal sensorial stimuli added during kangaroo care failed to show additional effects in PN as compared with conventional kangaroo care. However, this should be added as non-pharmacological care during painful PN procedures.

CLOSING REMARKS

Kangaroo care is a low-cost strategy and can be recommended as a non-pharmacological method that can be a method of choice for PN pain control, because it acts as a physiological response mediator and determines better autonomic stability. In addition, kangaroo care promotes mother-child proximity, increasing maternal confidence, favoring breastfeeding and benefiting the baby's growth and development and. It is important to encourage this method, which it is easy, low cost and can be performed both before and during painful invasive procedures in the NU, thereby contributing to pain control. We should emphasize that, for the sake of a safe procedure, kangaroo care can only be used for clinically stable newborns, who were previously evaluated by an experienced NU professional.

RESUMO

Apesar de ser conhecido que recém-nascidos de baixo peso são capazes de vivenciar a dor, muitos procedimentos de rotina ainda são realizados sem o uso de analgésicos farmacológicos ou não farmacológicos. A posição canguru é uma estratégia de baixo custo e pode ser utilizado como medida de escolha no manejo da dor de recém-nascidos pré-termos. Torna-se importante encorajar a prática desse método pelas mães, uma vez que é fácil e pode ser realizado antes e durante procedimentos dolorosos invasivos em unidades neonatais contribuindo para a redução álgica.

Descritores: Prematuro; Dor; Humanização da assistência; Aleitamento materno; Analgesia

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