

Venipuncture was less painful and more efficient than heel lance for blood testing in newborns

Larsson BA, Tannfeldt G, Lagercrantz H, et al. *Venipuncture is more effective and less painful than heel lancing for blood tests in neonates. Pediatrics* 1998 May;101:882-6.

Question

Is venipuncture of the dorsal side of the hand less painful and more efficient than heel lancing for blood testing in newborns?

Design

Randomised controlled trial.

Setting

The maternity ward at a hospital in Stockholm, Sweden.

Patients

120 consecutive healthy full term infants who required testing for phenylketonuria (PKU). Infants with any illness or abnormality were excluded. Follow up was 97.5% (51.5% girls).

Intervention

Infants were allocated to venipuncture (VP) with a 0.9 × 40 mm microlance needle (n = 50), heel lance with a small lancet (SL) (n = 50), or heel lance with a large lancet (LL) (n = 20). Before the VP, the dorsum of the hand was gently squeezed to visualise the vein. The SL was placed on the skin, and when pressure was applied to the end of the device a 2 mm lancet penetrated the skin. The LL required hand power to penetrate the skin with a sharp triangular edge of 2.5 mm. All infants were fed 1-2 hours before testing and were sleeping lightly or resting quietly when testing began. The nurse warmed the test area for 1 minute by placing it between her hands and then cleaned the area with a disinfectant. After the needle or lancet penetrated the skin, infants were left undisturbed for 60 seconds with no effort to induce blood flow. If blood flow was not sufficient, additional skin punctures or squeezing of the heel were done to obtain enough blood for the PKU test.

Main outcome measures

Pain assessed using the Neonatal Facial Coding System (NFCS), latency to cry from the skin puncture, total crying time, number of skin punctures needed, and time to complete the test.

Main results

The VP group had a lower median NFCS score than the SL group and the LL group 0-15 seconds after the first skin puncture ($p < 0.02$ and $p < 0.001$, respectively) and during manipulation for blood sampling at 60-75 seconds ($p < 0.001$ for both). After the first puncture, fewer infants cried in the VP group (44%) than in the SL (72%) and LL (85%) groups ($p < 0.001$), and the duration of crying during the entire procedure was shorter for the VP group (median 82 sec) than for the SL group (median 270 sec) ($p < 0.001$). The test was completed with only 1 puncture in 86% of infants in the VP group compared with 40% in the LL group ($p < 0.01$) and 19% in the SL group ($p < 0.003$). The median time to successfully complete the test was shorter for the VP group (191 sec) than the LL group (279 sec) and the SL group (419 sec) ($p < 0.05$ and $p < 0.001$, respectively).

Conclusions

In newborns having a blood test, venipuncture of the dorsal side of the hand was less painful (based on facial expression scores and crying) than a heel lance using a small or large lancet. The test took less time with venipuncture and was more often completed with only 1 skin puncture.

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A modified version of this abstract appears in *Evidence-Based Medicine*.

Commentary

Few studies have focused on methods to reduce the painful effects of routine procedures done on newborns. This study by Larsson *et al* is particularly interesting because rather than evaluating a strategy to alleviate pain caused by heel lancing (eg, topical anaesthesia, sucrose, or non-nutritive sucking), it seeks to identify a less painful alternative to heel lancing.

One of the ways the authors determined the pain response was with the NFCS, which measures changes in facial activity. Facial actions included brow bulge, eyes squeezed shut, deepening of the nasolabial furrow, open lips, a taut cupped tongue, and stretching of the mouth (vertically and horizontally). This measure has been shown to reflect changes in pain intensity and is therefore useful for evaluating interventions for

pain relief.^{1,2} Two observers who independently rated the same videotapes of the newborns' facial activity and who were unaware of whether the infant had received a venipuncture or heel lance had a high level of agreement.

The findings of this study suggest a practical way to alleviate pain in newborns. Not only was venipuncture less distressing but the method was also more efficient: it took less time and fewer punctures. This could ultimately increase the comfort level of the baby and has implications for nurses' time. The skill level of a nurse may play a part in effectiveness; if venipuncture was adopted as policy, however, skill level would increase with training and frequent performance. In this study, all infants were fed 1-2 hours before testing, and when

tested, all were sleeping lightly or awake and resting quietly. In a study of pain expression in newborns experiencing a heel lance, Grunau, who developed the NFCS, found that infants who were awake and alert but inactive responded with the most facial activity, whereas infants who were quietly sleeping showed the least facial reaction and the longest latency to cry.¹ When possible, nurses should do the venipuncture under circumstances similar to those used by Larsson *et al*.

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¹ Grunau RV, Craig KD. *Pain* 1987;28:395-410.
² Grunau RV, Johnston CC, Craig KD. *Pain* 1990;42:295-305.



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