Published in final edited form as:

Arch Dis Child Fetal Neonatal Ed. 2015 July ; 100(4): F374–F375. doi:10.1136/archdischild-2015-308191.

Oral glucose during targeted neonatal echocardiography: is it useful?

Pascal M. Lavoie^{1,2}, Amelie Stritzke³, Joseph Ting^{1,2}, Mohammad Jabr⁴, Amish Jain⁵, Eddie Kwan^{1,6}, Ela Chakkarapani⁷, Paul Brooks⁸, Rollin Brant⁹, Patrick J. McNamara⁵, and Liisa Holsti^{1,2,10}

¹Children's & Women's Health Centre of British Columbia, Vancouver, British Columbia, Canada

²Department of Pediatrics/Division of Neonatology, University of British Columbia, Vancouver, British Columbia, Canada

³Department of Pediatrics/Division of Neonatology, University of Calgary, Calgary, Alberta, Canada

⁴Department of Neonatology, King Saud University, Riyadh, Saudi Arabia

⁵Department of Pediatrics/Division of Neonatology, University of Toronto, Toronto, Ontario, Canada

⁶Department of Pharmacy, University of British Columbia, Vancouver, British Columbia, Canada

⁷Neonatal Neuroscience, School of Clinical Medicine, University of Bristol, Bristol, UK

⁸Department of Pediatrics/Division of Cardiology, University of British Columbia, British Columbia, Canada

⁹Department of Statistics, University of British Columbia, Vancouver, British Columbia, Canada

¹⁰Occupational Science and Occupational Therapy, University of British Columbia, Vancouver, British Columbia, Canada

Correspondence to: Dr Pascal Lavoie, Child & Family Research Institute, 4th floor Translational Research Building, 950 West 28th Avenue, Vancouver, British Columbia, Canada V5Z 4H4; plavoie@cw.bc.ca or Dr Liisa Holsti, Developmental Neurosciences and Child Health, F513, 4480 Oak Street, Vancouver, British Columbia, Canada V6H3V4; liisa.holsti@ubc.ca.

Competing interests None declared.

Patient consent Obtained.

Ethics approval Children's & Women's Health Centre of British Columbia (C&W) Research Ethics Board (#H10-02069).

Provenance and peer review Not commissioned; externally peer reviewed.

Contributors PML: conceptualised and designed the study, performed echocardiography studies, analysed data, wrote the manuscript. AS: designed the study, performed echocardiographic studies, reviewed the manuscript. JT: performed echocardiographic studies, reviewed the manuscript. MJ: performed echocardiographic studies, reviewed the manuscript. AJ: helped design the echocardiography rating scale, including conducting pilot testing of the scale, scored all echocardiographic studies, reviewed the manuscript. EK: conducted the randomisation, prepared oral study solutions for the infants, reviewed the manuscript. EC: performed echocardiographic studies, reviewed the manuscript. PB: helped design the echocardiography rating scale, reviewed the manuscript. PJM: helped design the echocardiography rating scale, including conducting pilot testing of the scale, scored all echocardiographic studies, wrote the manuscript. RB: conducted the statistical analyses, contributed to the initial draft of the manuscript. LH: conceptualised and designed the study, obtained external funding, performed some of the data analysis (reliability), wrote manuscript. All authors reviewed and approved the final manuscript as submitted.

Targeted neonatal echocardiography (TNE) is widely used in the cardiovascular management of sick infants in neonatal intensive care unit (NICU).¹ TNE should only be performed by operators who possess the knowledge and skills to acquire high-quality images in a structured manner, in order to formulate a diagnosis and medical recommendation. Suboptimal image quality due to agitation of the infant during a TNE may prolong scan time and result in errors in measurements and interpretation, leading to incorrect medical decisions. Oral glucose solutions are recommended to reduce procedure-related stress in infants.² However, there are no data supporting this intervention in the context of the conductance of TNE. Anecdotally, many neonatologist sonographers across the globe have adopted the routine use of oral glucose to reduce agitation and facilitate image acquisition during a TNE, despite a lack of supporting scientific evidence.

To determine whether oral glucose is effective in reducing agitation during a TNE, 104 infants born between 26 and 42 weeks of gestation in our level 2/3+ NICU were randomly assigned in a four-arm factorial study design where they receive either a 25% oral glucose solution given via a soother versus a water placebo, with or without gentle facilitated tucking (FT) of the infant. The intervention was blinded and occurred following informed consent during a single, structured TNE (details at: ClinicalTrials.gov: NCT01253889). The primary outcome was a change in Behavioural Indicators of Infant Pain (BIIP) across four phases of the TNE: at *baseline*, 2 min after administration of the oral solution (*post-solution*), halfway through (*mid-ECHO*) and immediately after completion of the scan (*recovery*), coded using bedside videotaping. BIIP is a highly sensitive and validated measure of physiological and behavioural indices with scores ranging from 0 to 9. Relatively minor handling such as a delicate diaper change increases BIIP by ~1 point, whereas in comparison more painful procedures such as a blood collection can increase BIIP by 5–9 points.³ A sample size of 25 infants per group ensured sufficient power to detect a minimally clinically significant increase of 2 points on the BIIP scale, with 80% power and 5% α error. Analysis was done by intention to treat. Three infants were excluded due to corrupted digital video data. Baseline characteristics including gestational age, birth weight, timing of the TNE and other variables were comparable in each group. Notably, BIIP scores remained low (≤ 2) during the TNE in all four groups. Furthermore, we observed no additive effect of glucose and FT on changes in BIIP scores (table 1), and on the quality or duration of the scan (not shown). In conclusion, our trial showed that TNE can be performed with minimal disruption of infants simply by observing a set of soothing measures, including the use of a pacifier and prewarming the sonographic gel. Moreover, in this context the use of oral glucose in a majority of stable infants who are able to receive oral solutions offers no additional measurable clinical benefits. While prevention of stress in infants remains a high priority in neonatal intensive care, concerns have been expressed that repeated use of oral sweeteners in itself may have adverse long-term neurodevelopmental effects, particularly in preterm infants.⁴ In view of our findings, the routine use of oral glucose during a TNE cannot be recommended. Rather, non-pharmacological measures should be used to calm infants.

Acknowledgments

Funding This study was funded by the Alva Foundation (to LH). PML is supported by Clinician-Scientist Awards from the CFRI and the Michael Smith Foundation for Health Research (MSFHR). LH is supported by a Canadian Institutes of Health Research Canada Research Chair.

References

1. El-Khuffash AF, McNamara PJ. Neonatologist-performed functional echocardiography in the neonatal intensive care unit. *Semin Fetal Neonatal Med.* 2011; 16:50–60. [PubMed: 20646976]
2. American Academy of P, Committee on F, Newborn, Canadian Paediatric S, Fetus, Newborn C. Prevention and management of pain in the neonate: An update. *Adv Neonatal Care J.* 2007; 7:151–60.
3. Holsti L, Grunau RE, Oberlander TF, et al. Is it painful or not? Discriminant validity of the Behavioral Indicators of Infant Pain (BIIP) scale. *Clin J Pain.* 2008; 24:83–8. [PubMed: 18180641]
4. Slater R, Cornelissen L, Fabrizi L, et al. Oral sucrose as an analgesic drug for procedural pain in newborn infants: a randomised controlled trial. *Lancet.* 2010; 376:1225–32. [PubMed: 20817247]

Table 1

Primary estimates and 95% CIs for changes in BIIP across intervention phases

Phase	Comparison	Estimates (95% CI)
Post-solution	Glucose–water	–0.47 (–1.07 to 0.13)
	Facilitated tucking–no tucking	0.15 (–0.45 to 0.75)
Mid-ECHO	Glucose–water	–0.27 (–0.95 to 0.40)
	Facilitated tucking–no tucking	–0.04 (–0.71 to 0.64)
Recovery	Glucose–water	–0.58 (–1.22 to 0.07)
	Facilitated tucking–no tucking	0.18 (–0.47 to 0.83)

BIIP, Behavioural Indicators of Infant Pain.