Hemodynamic Effects of Cut-Cord milking in Very Preterm Infants: A Randomized Controlled Trial (Hemodynamics of MoCC Trial)

W El-Naggar[1], S Mitra[1], J Abeysekera[1], T Disher[2], T Hatfield[1], A Galal[1], C Woolcott[3], J Dorling[1]

[1]Department of Pediatrics, Dalhousie University, Halifax, Nova Scotia, Canada
[2]Faculties of Computer Science and Graduate Studies, Dalhousie University, Halifax, Nova Scotia, Canada
[3]Perinatal Epidemiology Research Unit, Departments of Obstetrics & Gynecology and Pediatrics, Dalhousie University, Halifax, Nova Scotia, Canada

Introduction

- Cut-umbilical cord milking (C-UCM) may be an alternative when deferred cord clamping (DCC) is not feasible
- Earlier, we reported the feasibility of C-UCM in very preterm infants

Objective

- To investigate hemodynamic effects of C-UCM during stabilization of very preterm infants after birth

Methods

- This is a sub-study of the MoCC trial
- Infants born to eligible, consenting women presenting in labor at <32 weeks' gestation were randomized to:
  - C-UCM while supporting breathing following 30 seconds of DCC (to provide initial resuscitation steps) or
  - DCC for 30-60 seconds (standard practice)
- Clinical, echocardiographic and cerebral blood flow measures (at 12-24 hours of age) were compared between both groups
- The ultrasonographer and interpreter were blind to randomization
- Analysis was by intention to treat

Results

- Forty-five infants (C-UCM, n=21; DCC, n=24) received full hemodynamic assessment
- Mean gestational age (SD) was 28.8 (2.4) weeks (Table 1)
- Mean blood pressure on admission and mean SVC flow at 12-24 hours were lower in the C-UCM group [adjusted mean difference (95% CI) -6.9 mmHg (-12.1, -1.6) and -30.9 mL/kg/min (-52.9, -8.9), respectively (Table 2)
- However, the risks of hypotension in the first 72 hours and low SVC flow <55 mL/kg/min were not significantly different
- Similarly, measures of left ventricular function, cardiac output, and cerebral blood flow were not significantly different between the two groups

Table 1: Maternal and infant baseline characteristics

Characteristic	C-UCM N = 21[1]	DCC N = 24[1]	p-value[2]
Maternal age in years	31.0 (29.0, 34.0)	33.0 (29.5, 36.5)	0.3
Maternal diabetes	4 (19%)	5 (21%)	>0.9
Maternal hypertension	11 (52%)	8 (33%)	0.2
Multiple pregnancies	4 (19%)	4 (17%)	>0.9
Antenatal steroids	20 (95%)	24 (100%)	0.5
Vaginal deliveries	6 (29%)	10 (42%)	0.4
Gestational age at birth, weeks	28.6 (2.5)	29.1 (2.4)	0.5
Male	8 (38%)	17 (71%)	0.03
Small for gestational age, < 10th percentile	0 (0%)	2 (8.3%)	0.5
Birth weight (grams)	1,045 (820, 1,320)	1,253 (915, 1,688)	0.4
Apgar score at 1 min	5 (3.0, 8.0)	5 (3.5, 7.5)	0.7

Median (Q1, Q3); Mean (SD). Dichotomous data presented as n (%), continuous data presented as mean (SD) or median (Q1, Q3). 2Pearson's Chi-squared test; Wilcoxon rank sum test; Fisher's exact test.

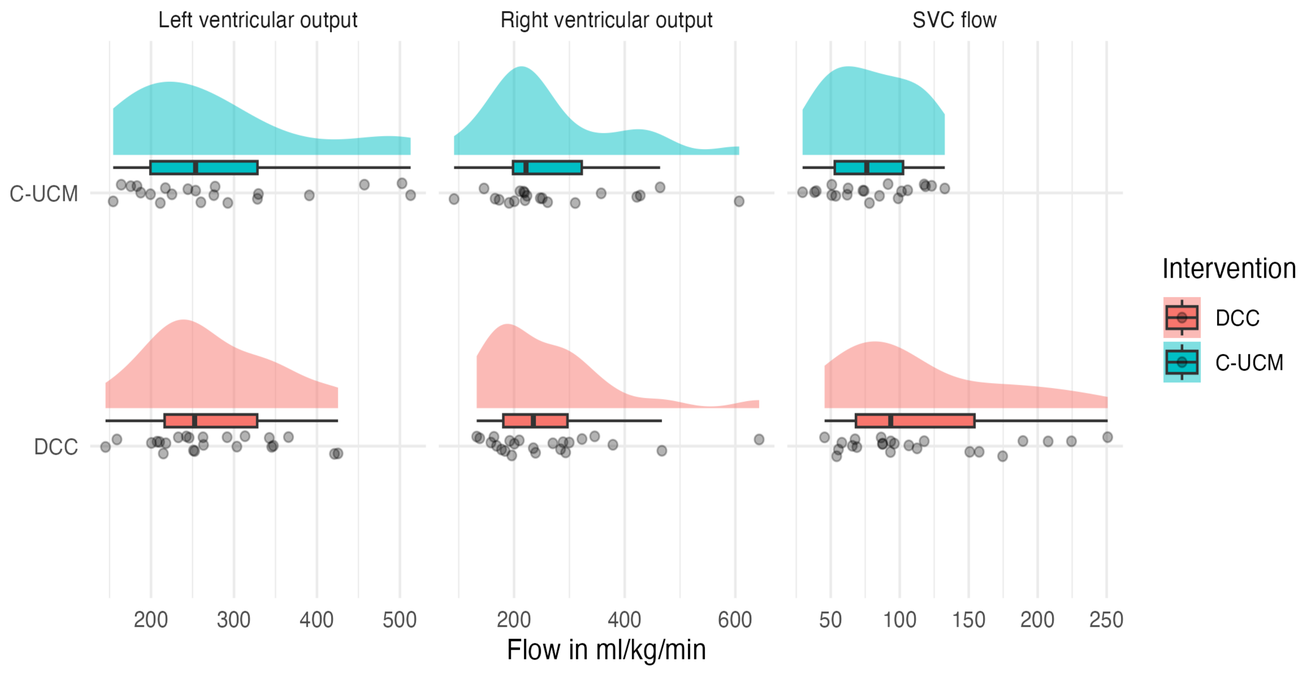
Results

Table 2: Cardiovascular, echocardiographic and cerebral blood flow outcomes

Characteristic	C-UCM N = 21	DCC N = 24	Crude Difference (95% CI)	Adjusted Difference (95% CI)
Admission mean blood pressure, mmHg	39 (8)	46 (10)	-7.1 (-12.3 to -1.9)	-6.9 (-12.1 to -1.6)
Hypotension in first 72 hours	0 (0%)	2 (8.3%)		
Inotropic support in first 72 hours	0 (0%)	1 (4.2%)		
Hydrocortisone use in first 72 hours	4 (19%)	1 (4.2%)	0.15 (-0.09 to 0.38)	0.12 (-0.08 to 0.33)
Volume expander	0 (0%)	0 (0%)		
CRIB II score	7.2 (4.0)	6.5 (3.9)	0.8 (-1.6 to 3.1)	-0.1 (-0.8 to 0.7)
Age at echo/US study, hours	18.1 (5.0)	18.4 (4.2)	-0.3 (-3.1 to 2.4)	-0.24 (-3.05 to 2.57)
SVC flow, mL/kg/min	79 (31)	115 (59)	-35.9 (-61.4 to -10.4)	-30.9 (-52.9 to -8.9)
Low SVC flow <55 mL/kg/min	(30%)	(8.7%)	0.21 (-0.04 to 0.46)	0.19 (-0.07 to 0.44)
Right ventricular output, mL/kg/min	270 (126)	260 (118)	10.0 (-62.2 to 82.2)	17.3 (-53.8 to 88.4)
Left ventricular output, mL/kg/min	278 (107)	272 (76)	5.9 (-48.8 to 60.7)	11.1 (-44.0 to 66.1)
Fraction shortening	37 (8)	35 (8)	1.7 (-2.9 to 6.3)	1.9 (-2.4 to 6.1)
PDA size, mm	1.4 (0.4)	1.3 (0.6)	0.1 (-0.2 to 0.5)	0.2 (-0.1 to 0.5)
PDA, medically treated	(29%)	(13%)	0.16 (-0.1 to 0.4)	0.11 (-0.10 to 0.32)
ACA peak systolic velocity, cm/s	17.4 (4.3)	21.0 (6.4)	-3.6 (-6.5 to -0.8)	-3.4 (-5.7 to -1.0)
ACA end diastolic flow, cm/s	4.8 (2.1)	5.7 (2.5)	-0.9 (-2.3 to 0.6)	-0.8 (-1.9 to 0.3)
ACA pulsatility index	1.3 (0.4)	1.3 (0.5)	0.00 (-0.2 to 0.3)	0.0 (-0.2 to 0.3)
ACA resistive index	0.7 (0.1)	0.7 (0.2)	0.0 (-0.1 to 0.1)	0.0 (-0.1 to 0.1)
MCA peak systolic velocity, cm/s	26 (9)	26 (7)	-0.3 (-5.1 to 4.4)	0.1 (-4.1 to 4.2)
MCA end diastolic flow, cm/s	7.3 (2.8)	7.2 (2.9)	0.1 (-1.4 to 1.6)	0.2 (-1.2 to 1.7)
MCA pulsatility index	1.3 (0.2)	1.3 (0.4)	0.0 (-0.2 to 0.2)	0.0 (-0.2 to 0.2)
MCA resistive index	0.7 (0.1)	0.7 (0.2)	0.0 (-0.1 to 0.1)	0.0 (-0.1 to 0.1)

Dichotomous data presented as n (%), continuous data presented as either mean (Sd) or median (Q1, Q3).

Abbreviations: C-UCM: cut umbilical cord milking; CRIB: Clinical Risk Index for Babies; SVC: superior vena cava; PDA: patent ductus arteriosus; ACA: anterior cerebral artery; MCA middle cerebral artery. Adjusted models include linear term for gestational age.



Abbreviations: C-UCM: cut umbilical cord milking; DCC: deferred cord clamping; SVC: superior vena cava; LVO: left ventricular output; RVO: right ventricular output.

Figure 1: Comparison of SVC flow, LVO, and RVO between study groups

Discussion

- C-UCM after 30 seconds of DCC and while supporting breathing, may not cause hemodynamic compromise compared to the standard practice of DCC for 30-60 seconds
- The study findings support the feasibility of C-UCM in very preterm infants

References

- R Bora R, Bandyopadhyay S, Saha B, Mukherjee S, Hazra A. Cut umbilical cord milking (C-UCM) as a mode of placental transfusion in non-vigorous preterm neonates: a randomized controlled trial. Eur J Pediatr 2023;182:3883-91.
- El-Naggar W, Mitra S, Abeysekera J, Disher T, Woolcott C, Hatfield T, McMillan D, Dorling J. Milking of the Cut Cord During Stabilization of Infants Born Very Premature: A Randomized Controlled TrialJ Pediatr. 2025 Mar:278:114444.