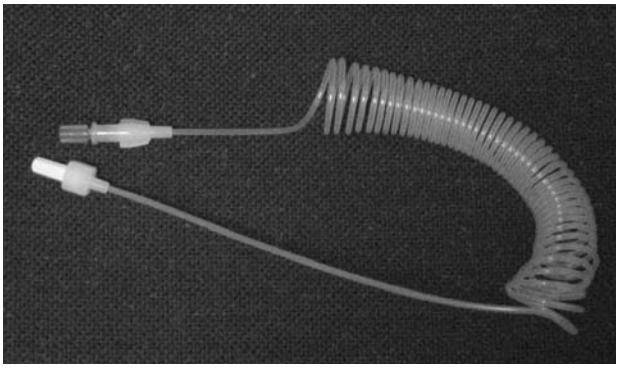

FIGURE Coiled line used for plexus block and epidural infusions.

Thirty millilitre syringes are used for single-shot injections and for the initial injection when a continuous infusion is used (for continuous plexus nerve block analgesia). Unfortunately, the labelled syringe used for continuous infusion is not a dedicated one (30 mL is too small: too frequent changes are needed).

We use dedicated coiled lines as well (Figure, Vygon laboratories, Ecouen, France). These lines are used on plexus nerve block lines and epidural lines in order to avoid the accidental iv infusion of local anesthetics.

In any event, even with these precautions, we agree that: "the quite remarkable capacity for a human to circumvent almost any safeguards against medical error" will persist.

Jean-Christophe Favier MD
David Plancade MD
Pascal Boulland MD
Metz Armées, France

Reference

1 *Favier JC.* Avoiding the accidental iv injection of local anaesthetics (author reply). Can J Anesth 2003; 50: 1077–8.

Are non-depolarizing neuromuscular blocking agents innocuous for the neonates?

To the Editor:

I read with interest the article[1] written by Dr. Littleford and was glad to see she did not make the statement commonly found in most textbooks that the administration of a neuromuscular relaxant does not affect Apgar or neurobehavioural scores. Partial residual curarization of the neonate can occur when clinical doses of a non-depolarizing neuromuscular blocking agent is used during a Cesarean section despite umbilical vein concentrations lower than the known neonatal EC_{50} for that specific agent.[2] In one randomized double-blind study, at 15 min of life, the proportion of neonates with an abnormal neurobehavioural adaptive capacity score was higher in the group whose mothers received an ED_{90} dose of atracurium (14/25) than in the group whose mothers received an ED_{95} dose of d-tubocurarine (6/21; $P < 0.05$).[2] The difference was seen in the active tone category (mode score 7 *vs* 9; $P = 0.02$) and was statistically significant for active contraction of the neck extensors (mode score 1 *vs* 2; $P = 0.01$).[2]

Since the umbilical vein to maternal vein (UV/MV) ratio of non-depolarizing neuromuscular blocking agents varies from 7 to 26% and fetal concentrations will increase with higher injected doses and with longer injection-to-delivery interval for drugs with a high molecular weight, when total avoidance of these drugs before clamping of the umbilical cord is not feasible, using the lowest possible dose of an agent with a low UV/MV ratio and short duration of action appears to be the safest choice.[3]

Joanne Guay MD FRCPC
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References

1 *Littleford J.* Effects on the fetus and newborn of maternal analgesia and anesthesia: a review. Can J Anesth 2004; 51: 586–609.
2 *Perreault C, Guay J, Gaudreault P, Cyrenne L, Varin F.* Residual curarization in the neonate after caesarean section. Can J Anaesth 1991; 38: 587–91.
3 *Guay J, Grenier Y, Varin F.* Clinical pharmacokinetics of neuromuscular relaxants in pregnancy. Clin Pharmacokinet 1998; 34: 483–96.

Reply

The cautionary note articulated in Dr. Guay's letter to the Editor[1] has relevance clinically, although one of the assessment tools used to reach the conclusion has been shown to lack validity and reliability.[2] The Neurologic and Adaptive Capacity Score (NACS) should no longer be used to assess the effect of intrapartum maternal medication on the newborn.

Judith Littleford MD FRCPC
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References

1 *Guay J.* Are non-depolarizing neuromuscular blocking agents innocuous for the neonates? (Letter). Can J Anesth 2005; 52: 213–14.

2 *Halpern SH, Littleford JA, Brockhurst NJ, Youngs PJ, Malik N, Owen HC.* The neurologic and adaptive capacity score is not a reliable method of newborn evaluation. Anesthesiology 2001; 94: 958–62.

Hemodynamic response to moderate dobutamine dose in OPCAB during acute normovolemic hemodilution

To the Editor:

Acute normovolemic hemodilution (ANH) is a widespread practice during coronary artery surgery and numerous studies emphasize the safety of a low transfusion trigger in these patients.[1–3] During off-pump coronary artery bypass surgery (OPCAB), periods of hemodynamic instability that require inotropic therapy may occur.[4] However, no studies, except experimental, evaluate how hemodilution influences the hemodynamic response to inotropic therapy.[5] Our study compared the hemodynamic response to dobutamine in patients with coronary artery disease (CAD) at two different levels of ANH.

After Ethical Board approval, 40 patients with CAD scheduled for OPCAB surgery were randomized to two groups after induction of anesthesia. Anesthesia was induced with midazolam (0.2 $mg \cdot kg^{-1}$), fentanyl (5 $\mu g \cdot kg^{-1}$), pancuronium-bromide (1 $mg \cdot kg^{-1}$) and maintained by halothane (concentrations up to 0.5%), fentanyl (in total up to 15 $\mu g \cdot kg^{-1}$) and pancuronium-bromide (bolus of 0.25 $mg \cdot kg^{-1}$). All patients were monitored with pulmonary artery and arterial catheters, 5-lead electrocardiogram, pulse oximeter, capnography and transesophageal echocardiography.

In the moderate group ANH was performed up to hemoglobin values of 95 to 105 $g \cdot L^{-1}$ and, in the severe group, up to hemoglobin values of 75 to 85 $g \cdot L^{-1}$. Calculated blood volume to obtain the required level of ANH was replaced with the same volume of 6% hydroxyethylstarch. After ANH, both groups were treated with dobutamine 5 $\mu g \cdot kg^{-1} \cdot min^{-1}$ for 15 min. Hemodynamic and oxygenation variables were measured using the thermodilution method after induction, 15 min after ANH and 15 min after starting the dobutamine infusion. Nonparametric tests were used for statistical analysis due to the small number of patients.

In the moderate ANH group, dobutamine infusion was associated with a significant increase in cardiac index (CI; 2.7 ± 1.1 *vs* 3.3 ± 1.1 $L \cdot min^{-1} \cdot m^{-2}$, $P < 0.01$) and oxygen delivery (DO_2; 391 ± 132 *vs* 444 ± 96 $mL \cdot min^{-1} \cdot m^{-2}$, $P < 0.05$), while in the severe ANH group, CI and DO_2 did not change significantly after the administration of dobutamine (Table). Thus, dobutamine could not increase CI to compensate the reduced DO_2 after severe ANH while the moderate ANH group had favourable hemodynamic and oxygenation variables (Table).

In conclusion, hemodynamic response to dobutamine is significantly better in moderate compared to severe ANH. Our results suggest OPCAB surgery patients should have hemoglobin values of 100 $g \cdot L^{-1}$ during ANH. These preliminary results should be evaluated in further studies.

TABLE Course of the hemodynamic and oxygenation data

Variables	*Group*	*After anesthesia induction*	*15 min after ANH*	*15 min after starting dobutamine*
HGB ($g \cdot L^{-1}$)	moderate ANH	122 ± 13	102 ± 5*	100 ± 8
	severe ANH	118 ± 17	78 ± 3**‡	80 ± 5‡
CI ($L \cdot min^{-1} \cdot m^2$)	moderate ANH	1.9 ± 0.5	2.7 ± 1.1**	3.3 ± 1.1**
	severe ANH	1.9 ± 0.4	2.5 ± 0.7**	2.5 ± 0.6‡
DO_2I	moderate ANH	326 ± 87	391 ± 132*	444 ± 96*
($mL \cdot min^{-1} \cdot m^{-2}$)	severe ANH	322 ± 92	286 ± 118*†	282 ± 81‡
VO_2I	moderate ANH	80 ± 18	83 ± 23	116 ± 14*
($mL \cdot min^{-1} \cdot m^{-2}$)	severe ANH	78 ± 23	79 ± 17	101 ± 11*†
O_2ER (%)	moderate ANH	24.4 ± 4.7	21 ± 4	26.4 ± 4.7*
	severe ANH	24.1 ± 6.3	29.1 ± 7.1*†	36.3 ± 5.6*†

Data presented with mean ± standard deviation. ANH = acute normovolemic hemodilution; CI = cardiac index; DO_2I = oxygen delivery index; VO_2I = oxygen consumption index; O_2ER = oxygen extraction rate; HGB = hemoglobin. *Significance within groups in comparison with previous measurement $P < 0.05$; **significance within groups in comparison with previous measurement $P < 0.01$; †significance between groups $P < 0.05$; ‡significance between groups $P < 0.01$.