Can J Anesth/J Can Anesth (2022) 69:909–911
https://doi.org/10.1007/s12630-022-02268-3

CORRESPONDENCE

A retrospective cohort comparison of programmed intermittent epidural bolus (PIEB) and continued epidural infusion (CEI) on delivery mode

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Received: 23 March 2022 / Revised: 1 April 2022 / Accepted: 2 April 2022 / Published online: 4 May 2022

Keywords continuous epidural infusion (CEI) · labour analgesia · programmed intermittent epidural bolus (PIEB)

To the Editor,

Programmed intermittent epidural bolus (PIEB) may decrease the amount of local anesthetic consumption, reduce motor blockade, and decrease instrumental vaginal and/or Cesarean deliveries when compared with traditional continued epidural infusions (CEI).[1, 2] Before 2015, CEI in conjunction with patient-controlled epidural analgesia (PCEA) was used to maintain labour analgesia in our institution. After 2015, labour analgesia was exclusively delivered using PIEB with PCEA. We sought to assess the association with operative delivery of PIEB *vs* CEI and hypothesized that PIEB use would not be associated with an increased rate of operative deliveries (instrumental or Cesarean) compared with CEI.

With institutional ethics approval, we conducted a population-based cohort analysis using data from the Nova Scotia Atlee Perinatal Database.[3] Parturients with term, singleton pregnancies and vertex presentation, receiving epidural analgesia who delivered at IWK Health Centre (Halifax, NS, Canada) in 2014 (CEI) and 2017 (PIEB) were included. In 2014, Graseby™ 3300 PCA syringe infusion pumps (Smiths Medical International Ltd, Watford, Herts., UK) were used to deliver 6 $mL \cdot hr^{-1}$ (ropivacaine 0.1% + fentanyl 2 $\mu g \cdot mL^{-1}$) with PCEA 6 mL every 10 minutes, as required. In 2017, labour epidural analgesia was achieved using PIEB (ropivacaine 0.1% + fentanyl 2 $\mu g \cdot mL^{-1}$) 8 mL every 45 min via Smiths Medical CADD® infusion pumps at a rate of 250 $mL \cdot h^{-1}$. The first pump bolus was delivered 15 min after initiation and with the same PCEA parameters as CEI. A Portex® DuraFlex® 19G multilumen catheter (Smiths Medical) was used for both groups.

For 80% power, 6,036 participants were required to see a 2% change in the operative delivery rate, which was considered clinically significant. We compared categorical data with the Chi square test. We performed multivariable logistic regression using covariates with $< 20\%$ missing data and statistical significance in the univariate analysis to determine their effect on delivery method. Three variables had $> 20\%$ missing data (education level, induction of labour, and cord artery pH value).

The sample included 7,967 patients. The univariate analysis showed that greater parturient age, higher post-secondary education, and higher maternal weight were significantly associated with more operative deliveries. All

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Table 1 Multivariable logistic regression on predictors of delivery method

Predictor	Operative *vs* vaginal deliveries			
	Reference group	OR	CI	*P* value
PIEB	CEI	1.31	1.10 to 1.56	0.002
Parturient age ≥ 35 yr	< 35	1.31	1.05 to 1.62	0.02
Parity	> 0	1.96	1.57 to 2.44	< 0.001
Hours from dilation to delivery[a]	N/A	1.77	1.68 to 1.87	< 0.001
Birth weight ≥ 4 kg	< 4 kg	1.16	0.88 to 1.53	0.30
Parturient weight (kg)[b]	N/A	1.00	0.99 to 1.00	0.28

[a] One-unit increase is 1 hour

[b] One-unit increase is 1 kg

CEI = continuous epidural infusion; CI = confidence interval; N/A = not applicable; OR = odds ratio; PIEB = programmed intermittent epidural bolus

other demographic variables were not statistically different. In the multivariable analysis (Table 1), PIEB was associated with an increased odds of operative delivery (odds ratio [OR], 1.32; 95% confidence interval, 1.11 to 1.56; $P = 0.002$). The proportion difference between the two groups was clinically significant for an observed 2.5% increase in operative deliveries for parturients who received PIEB compared with CEI. Nevertheless, these variables (PIEB and CEI) were not statistically significant when the definition of operative delivery was limited to Cesarean delivery ($P = 0.97$).

Our study found that parturients receiving PIEB were more likely to have an operative delivery than those receiving CEI (number needed to harm = 40). Several studies have found no difference in the mode of delivery[1] or reduced operative deliveries[2] when PIEB was compared with CEI. However, these studies were either not powered to detect differences in rates of instrumented vaginal deliveries, had a small sample size, or had wide variability in the drug dosing and PIEB regimens utilized.[1, 2, 4] Our results contrast with a systematic review and meta-analysis by Xu *et al.*,[5] which found decreased instrumented deliveries with PIEB compared with CEI (OR, 0.51). Nevertheless, this review included only primiparous parturients, while our study also included multiparous parturients.

Causation cannot be drawn from our findings. Changes in frequencies of events or mean differences observed from 2014 to 2017 could be due to clinical and cultural shifts. Also, anesthetic information such as total local anesthetic volume, presence of motor blockade, and number of rescue boluses were not available. The indication for operative delivery was not captured. Although arrested labour could be attributed to type of labour analgesia, this would be less likely for an operative delivery due to abnormal fetal heart rate, for example. While this observational study showed an association between less spontaneous vaginal deliveries using PIEB for labour analgesia when compared with CEI, the observed difference must be considered in the context of other variables that could impact delivery method that were not measured.

Disclosures Dr. George is part of an advisory board for Octapharma USA Inc. and an Associate Editor of the Canadian *Journal of Anesthesia/Journal canadien d'anesthésie*; he had no involvement in the handling of this manuscript.

Funding statement This work was supported by the Department of Anesthesia, Pain Management, and Perioperative Medicine, Dalhousie University, Halifax, NS, Canada (grant # IWK 1023127).

Editorial responsibility This submission was handled by Dr. Philip M. Jones, Deputy Editor-in-Chief, *Canadian Journal of Anesthesia/ Journal canadien d'anesthésie.*

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