

# Ropivacaine and fentanyl concentrations in umbilical cord blood and neonatal outcome after epidural analgesia administration using programmed intermittent bolus: a prospective study



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## Introduction

- Umbilical cord blood concentrations of ropivacaine and fentanyl have already been reported during continuous epidural labor analgesia.
- Using PIEB plus PCEA, umbilical cord blood concentrations have not been reported previously.
- In this study, we examined the umbilical venous drug concentration and neonatal outcome using PIEB plus PCEA during labor analgesia.

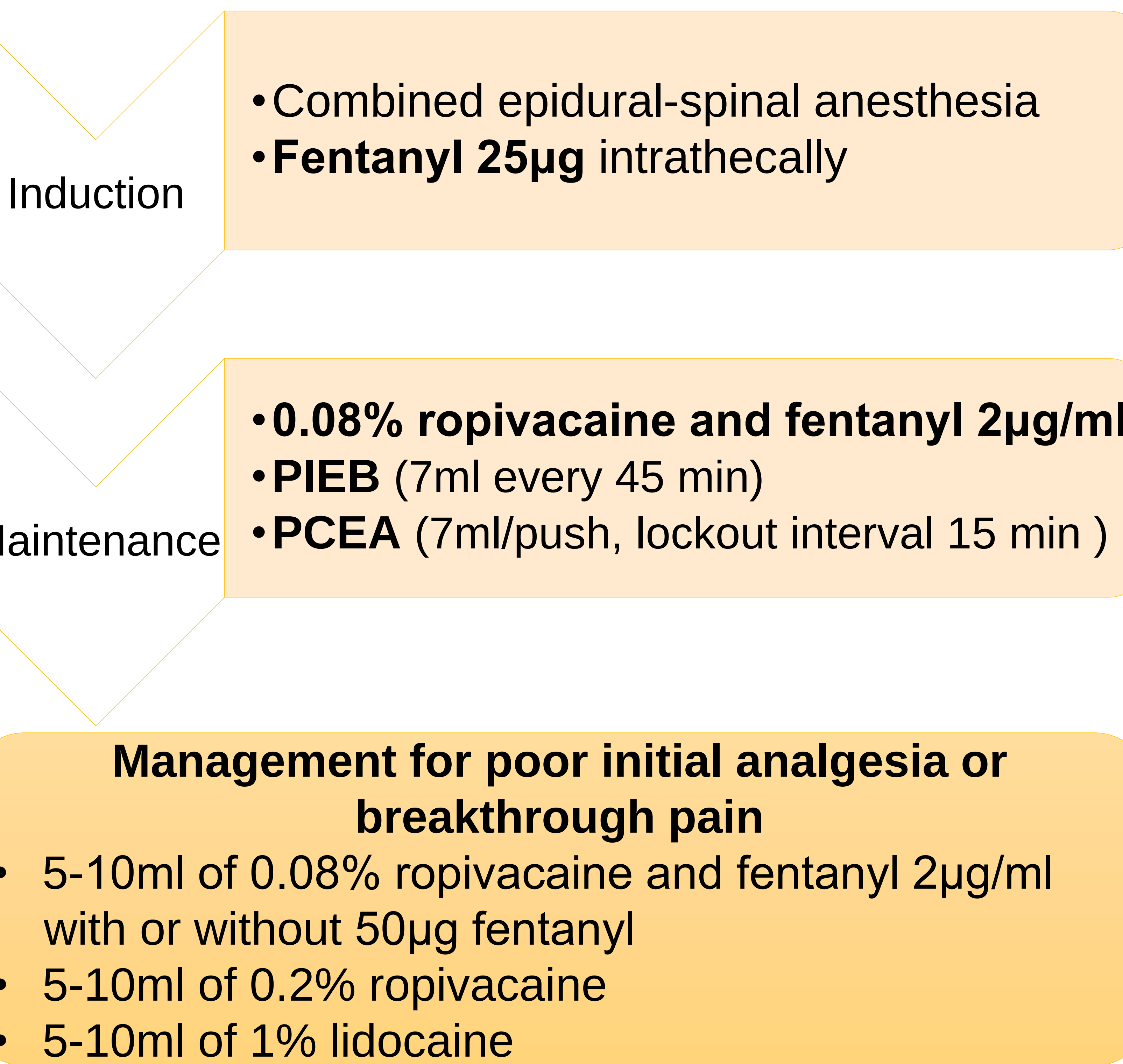
## Methods

- Prospective study between July and September 2022
- Inclusion criteria: Healthy parturient with a singleton pregnancy
- Exclusion criteria

| Before obtaining consent                                                                                                                                                                                                                                             | After obtaining consent                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fetuses with diseases<br>Intrauterine growth retardation<br>Pregnancy complications<br>Hypertensive disorder of pregnancy<br>Gestational diabetes<br>Thyroid diseases<br>Psychiatric disorders<br>Antiphospholipid antibody syndrome<br>Systemic lupus erythematosus | Using other methods and drugs<br>Epidural catheter replacement<br>Accidental dural puncture<br>Changes in the dosing regimen<br>Conversion to cesarean section<br>Insufficient blood sample |

- Outcome: umbilical venous drug concentration and neonatal outcome

## Labor analgesia in our hospital



# Results

Table 1. Maternal Characteristics

|                                    | median [range] or n (%) |
|------------------------------------|-------------------------|
| Age (years)                        | 34 [26-43]              |
| Height (cm)                        | 160 [152-173]           |
| Body weight at delivery (kg)       | 52[45-79]               |
| Body mass index at delivery        | 24 [18-31]              |
| Parity                             |                         |
| Nulliparous                        | 27 (54)                 |
| Gestational week (week)            | 40 [38-41]              |
| Labor type                         |                         |
| Spontaneous                        | 6 (12)                  |
| Induction                          | 17 (34)                 |
| Oxytocin augmentation              | 27 (54)                 |
| Delivery mode                      |                         |
| Spontaneous vaginal delivery       | 31 (62)                 |
| Vacuum                             | 19 (38)                 |
| Reason of vacuum delivery          |                         |
| Arrest of labor                    | 6 (12)                  |
| Non reassuring fetal status        | 13 (26)                 |
| Duration of 1st stage of labor (h) | 5.5 [0-17]              |
| Duration of 2nd stage of labor (h) | 1 [0-6]                 |

Table 2. Neonatal Characteristics

|                              | median [range] or n (%) |
|------------------------------|-------------------------|
| Birth weight (g)             | 3130 [2475-3909]        |
| Sex (male : female)          | 24 : 26                 |
| Umbilical artery pH          | 7.306 [7.213-7.364]     |
| Umbilical artery pH <7.2     | 0 (0)                   |
| Apgar score <7 at 1 minute   | 4 (8)                   |
| Apgar score <7 at 5 minute   | 0 (0)                   |
| Resuscitation                |                         |
| Free flow oxygen             | 13 (26)                 |
| CPAP                         | 5 (10)                  |
| Mask ventilation             | 2 (4)                   |
| Intubation                   | 0 (0)                   |
| Chest compression            | 0 (0)                   |
| NICU/GCU admission           | 7 (14)                  |
| Reason of NICU/GCU admission |                         |
| Respiration                  | 2 (4)                   |
| Severe neonatal asphyxia     | 1 (2)                   |
| Intracranial hemorrhage      | 1 (2)                   |
| Other                        | 3 (6)                   |
| Duration of NICU/GCU (day)   | 2 [2-5]                 |

Table 3. History of labor analgesia

|                                       | median [range]    |
|---------------------------------------|-------------------|
| Labor analgesia time (h)              | 5.8 [1.0-18.9]    |
| PCEA administration                   | 4 [1-12]          |
| PCEA request                          | 8 [1-44]          |
| Clinician bolus                       | 1 [0-4]           |
| Total ropivacaine dose (mg)           | 64.2 [20.4-215.2] |
| Total fentanyl dose (µg)              | 214 [109-543]     |
| Ropivacaine average dose per h (mg/h) | 12.5[7.7-22.3]    |
| Fentanyl average dose per h (µg/h)    | 38.8[23.8-122.8]  |

Table 4. Umbilical venous analgesic concentration

|                                   | median [range] or n (%) |
|-----------------------------------|-------------------------|
| Ropivacaine concentration (ng/ml) | 76.8[13-182]            |
| Fentanyl concentration (ng/ml)    |                         |
| <0.1 ng/ml                        | 11 (22)                 |
| 0.1 ng/ml                         | 18 (36)                 |
| 0.2 ng/ml                         | 18 (36)                 |
| 0.3 ng/ml                         | 1 (2)                   |
| 0.4 ng/ml                         | 2 (4)                   |

**Figure 1.** History of epidural bolus dose and umbilical venous ropivacaine and fentanyl concentrations at delivery

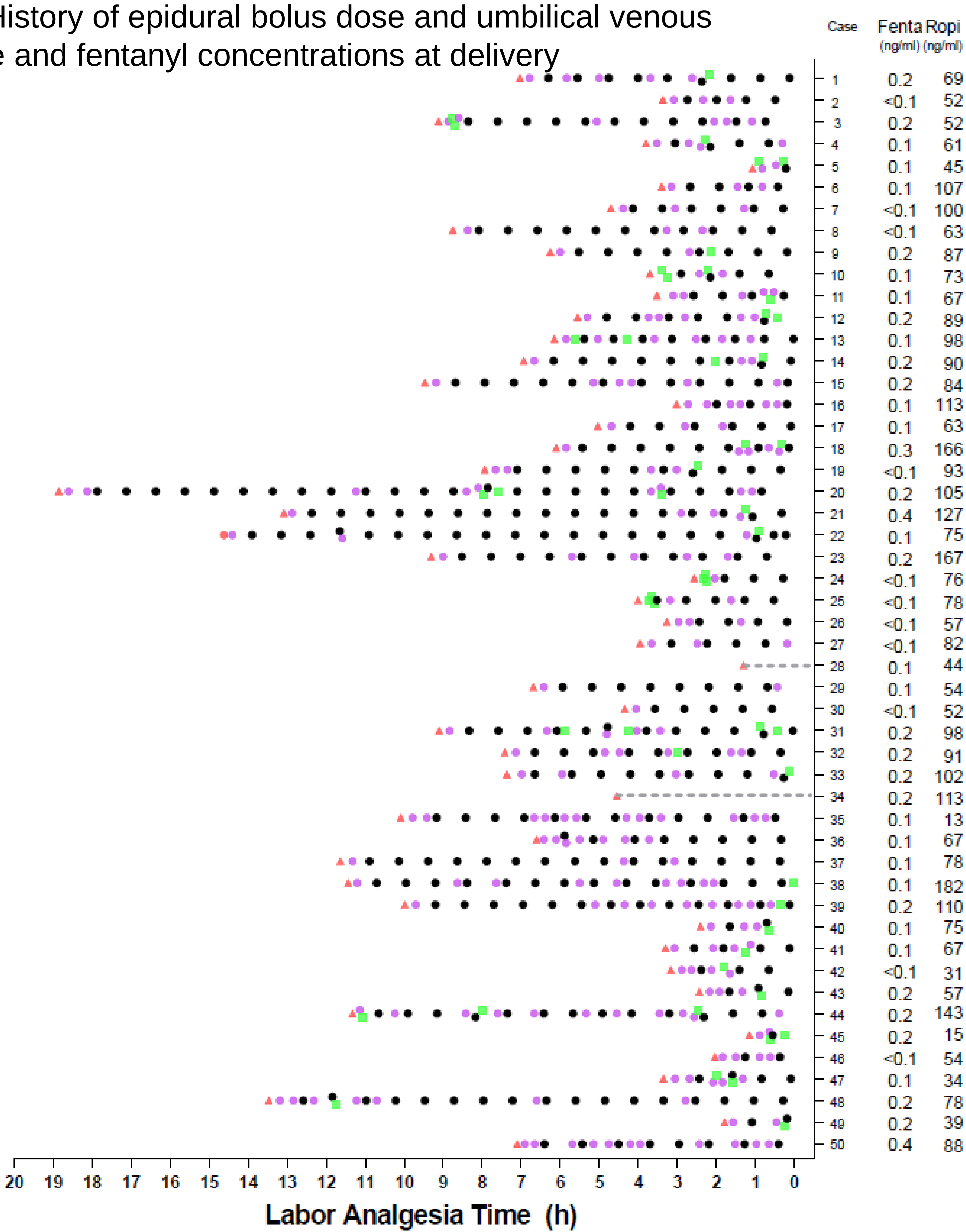
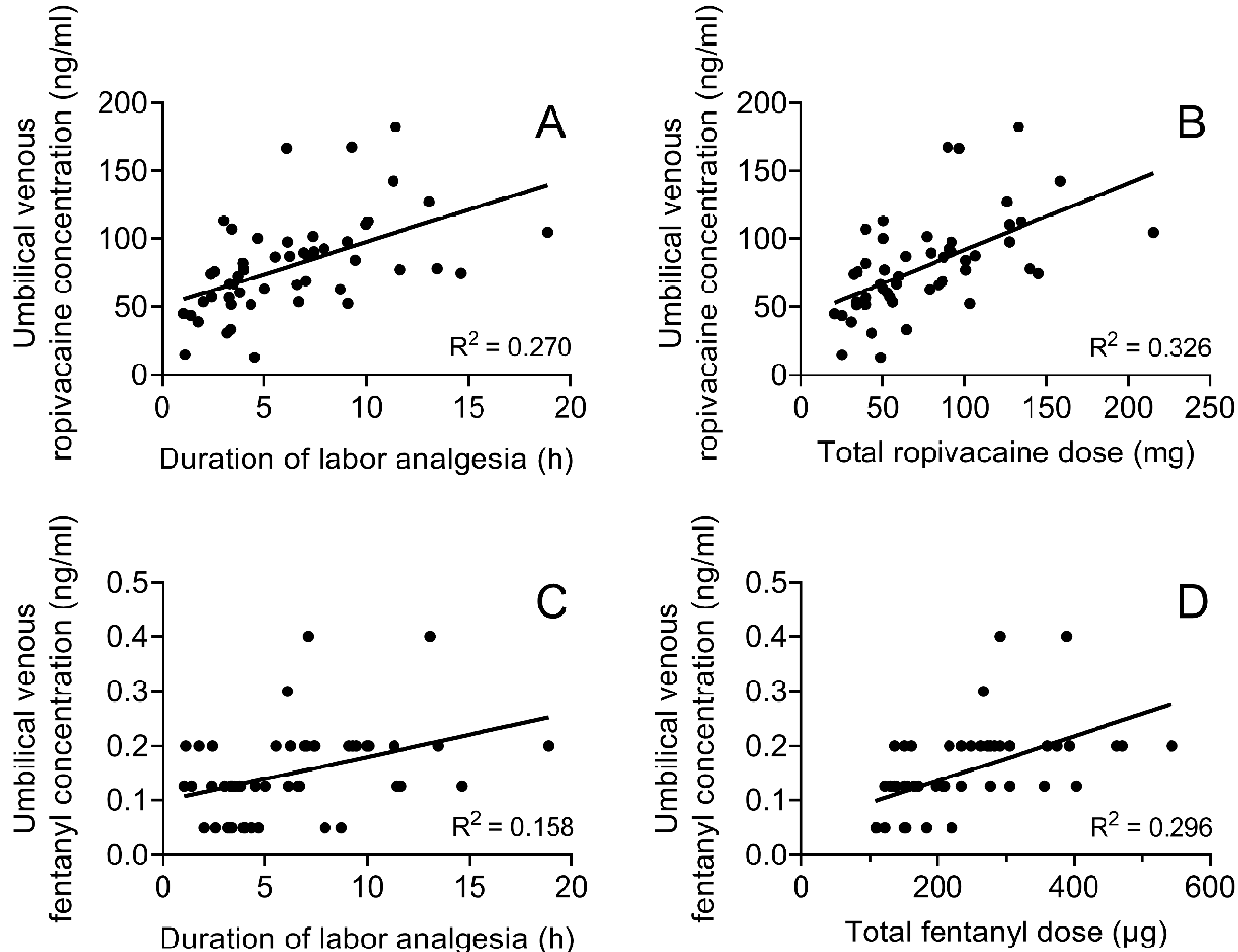


**Figure 2.** Umbilical venous ropivacaine and fentanyl concentrations *versus* duration of labor analgesia and total epidural dose or ropivacaine and fentanyl during labor analgesia



## Conclusion

- A dosing regimen using PIEB plus PCEA for labor analgesia did not increase the umbilical analgesic concentration at delivery.
- No neonates developed serious condition.

### References

1. Lee BB, et al. Reg Anesth Pain Med. 2002;27(1):31-6. 2. Bader AM, et al. Anesth Analg. 1995;81(4):829-32.  
3. Irestedt L, et al. Acta Anaesthesiol Scand. 1998;42(8):890-6.