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Respiratory muscle rigidity in a preterm infant after use of fentanyl during Caesarean section

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Abstract Fentanyl is in many neonatal intensive care units the sedative of choice. One side-effect is, however, the possibility of muscle and/or chest wall rigidity. A pregnant woman with a critical pulmonary valve stenosis had a balloon dilatation at 26 weeks of gestation. She was put on propranolol, but went into a severe cardiac failure. In week 31, she developed pregnancy induced hypertension. Periodically absent diastolic flow in the umbilical cord was demonstrated. A Caesarean section was performed using fentanyl as analgesia. A boy weighing 1440 g, had a 1 min Apgar score of 3 without respiratory movements. Mask ventilation was tried, but chest wall expansion was not achieved despite using high pressures. He was intubated and positive pressure ventilation attempted, with the same result. Despite the use of high pressures up to 60–70 cm H₂O, no chest movement could be achieved. An intravenous line was established in order to give naloxone and pancuronium. Just before the drugs were given, chest wall movements were achieved and the heart rate normalized.

Conclusion This is the first report on chest wall rigidity in a neonate after administration of fentanyl to the mother during Caesarean section.

Key words Fentanyl · Prematurity · Newborn · Muscle rigidity

Introduction

The use of opioid analgetics during labour may result in neonatal respiratory depression [1]. A side-effect of fentanyl, an opioid analgesic with a short duration of action, when given in large doses, is muscle rigidity [3, 4, 9]. The major use of fentanyl is therefore during anaesthesia, in conjunction with muscle relaxants such as pancuronium.

There are some reports of chest wall rigidity in neonates when fentanyl was administered as an analgesic drug [2, 8, 10]. There are also some reports of similar side-effects with fentanyl use in preterm infants [5, 6, 7], but so far not in a newborn infant after administration of fentanyl to the mother during Caesarian section.

Case report

A 20-year-old pregnant woman, with an undiagnosed systolic murmur first noted when she was aged 7, was subsequently found to have a critical pulmonary valve stenosis.

In the 26th week of gestation, a balloon dilatation of the pulmonary valve was performed. The subvalvular gradient was 110 mm Hg and the valvular 60–70 mm Hg. She was prescribed propranolol, but went into a severe cardiac failure.

In week 31, she developed pregnancy-induced hypertension with severe proteinuria and increasing blood pressure (175/110 mm Hg). In view of her pregnancy-induced hypertension and Doppler measurements of the umbilical cord showing periodically absent diastolic flow, a Caesarean section was arranged after pre-treatment with betamethasone. The Caesarean section was performed under general anaesthesia because of her cardiac failure. Her body weight was 56 kg and she was premedicated with morphine/scopolamine (7.5/0.3 mg) followed by a combination of fentanyl

(300 mg), diazepam (7.5 mg), ketamine (300 mg) and vecuronium (7 mg).

A male infant weighing 1440 g was delivered with an Apgar score of 3 at 1 min. (no respiratory movements and a heart rate of approximately 100/min). Mask ventilation was attempted but no chest movement was obtained even with high pressures (the safety valve was eventually blocked producing pressures in the range of 60–70 cm H₂O). The infant was intubated and mechanical ventilation attempted, but with the same inability to inflate the chest. An intravenous line was established to give naloxone and pancuronium. Just before the drugs were given, chest wall movements were achieved and the heart rate normalized, 8 min after delivery. The boy was put on a ventilator with moderate ventilator settings (PIP/PEEP was 22/4 cm H₂O with a rate of 40/min), but after 1 h, a severe respiratory alkalosis (pH 7.61 and pCO₂ 1.4 kPa) was found. A chest X-ray showed normal lungs without any sign of hyaline membrane disease. The child was extubated and subsequently breathed normally without any supplemental oxygen requirement.

At 1 year of age, he appears to be developmentally normal.

Discussion

Fentanyl, an opioid analgesic has a short duration of action, does not stimulate histamine release as does morphine, and is therefore, in many neonatal intensive care units, the sedative of choice [2, 8, 10]. One side-effect of fentanyl is, however, muscle and chest wall rigidity [4].

The use of fentanyl during anaesthesia causes chest wall rigidity in 36% to 95% of patients [3, 4, 9]. There are, however, few reports of this side-effect in newborn, premature infants [5, 6, 7]. Whether the phenomenon of muscle rigidity is dose-dependent is not known, but unlikely as the reported cases occurred after only moderate doses [5, 6, 7] and probably a low transplacental dose from the mother in our case. Being premature with a reduced ability to metabolize the drug may be an additional factor.

To our knowledge, this is the first report of chest wall rigidity in a neonate after administration of fentanyl to the mother during Caesarian section. Failure to recognize this possible side-effect could seriously compromise the infant. Early recognition is required to ensure appropriate reversal with naloxone and/or pancuronium.

References

1. Belfrage P, Boreus LO, Hartvig P, Irestedt L, Raabe N (1981) Neonatal depression after obstetrical analgesia with pethidine. The role of the injection-delivery time interval and of the plasma concentrations of pethidine and norpethidine. *Acta Obstet Gynecol Scand* 60:43–49
2. Bell SG, Ellis LJ (1987) Use of fentanyl for sedation of mechanically ventilated neonates. *Neonat Netw* 6:27–31
3. Comstock MK, Carter JG, Moyers JR, Stevens WS (1981) Rigidity and hypercarbia associated high dose fentanyl induction of anesthesia. *Anest Analg* 60:362–363
4. Christian CM 2nd, Waller JL, Moldenhauer CC (1983) Post-operative rigidity following fentanyl anesthesia. *Anesthesiology* 58:275–277
5. Huet F, Reiser V, Gouyon J-B (1992) Effet secondaire du fentanyl sur la ventilation mécanique de l'enfant prématuré. *Arch Fr Pédiatr* 49:841
6. Lajarrige C, Adafer M, Mouthemy G, Kemp L (1993) Effet du fentanyl sur la ventilation du prématuré. *Arch Fr Pédiatr* 50:274
7. Lemmen RJ van, Semmekrot BA (1996) Muscle rigidity causing life-threatening hypercapnia following fentanyl administration in a premature infant. *Eur J Pédiatr* 155:1667
8. Maguire DP, Maloney P (1988) A comparison of fentanyl and morphine use in neonates. *Neonat Netw* 7:27–35
9. Smith NT, Benthuisen JL, Bickford RG, Sanford TJ, Blasco T, Duke PC et al (1989) Seizures during opioid anesthetic induction – are they opioid-induced rigidity? *Anesthesiology* 71:852–862
10. Sweetwyne K (1993) Neonatal sedation and analgesia. *Neonat Pharmacol Q* 2:5–11