Clinical Report

Patient-controlled analgesia (PCA) using fentanyl in a parturient with a platelet function abnormality

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A term parturient with documented platelet dysfunction presented to the case room for induction of labour. Since this bleeding abnormality contraindicated the use of lumbar epidural analgesia (LEA), we elected to use an iv fentanyl patient-controlled analgesia (PCA) technique for pain relief during labour. The patient received a 50 μg fentanyl loading dose after which 20 μg boluses of fentanyl were self-administered every three minutes as required. The patient received a total of 400 μg of fentanyl over the 3½ hr of active labour. Mother and neonate tolerated the fentanyl without sequelae. If facilities to monitor the neonate and mother are present, this method of analgesia is useful in those patients where LEA is contraindicated.

Au terme d'une grossesse, une patiente porteuse d'une dysfonction plaquettaire devait avoir une induction de travail au bloc obstétrical. Ecartant l'usage d'une épidurale à cause des risques de saignement, nous avons employé du fentanyl en autoanalgésie (PCA) pour soulager les douleurs du travail. Après une dose initiale de 50 μg, la patiente s'injectait des doses de 20 μg de fentanyl iv aux 3 minutes prn. Elle utilisa un total de 400 μg de fentanyl au cours des 3,5 heures que dura le travail. La mère et le nouveau-né tolérèrent fort bien ce mode d'analgésie. L'autoanalgésie offre donc une alternative au bloc épidural lorsque ce dernier est contre-indiqué toutefois, nous recommandons de monitorer la mère et le nouveau-né pendant quelques heures.

Key words
ANAESTHESIA: obstetrical;
ANALGESIA: PCA;
ANALGESICS: fentanyl.

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Defects in the coagulation system are a contraindication to performing lumbar epidural analgesia (LEA).[1] However, the obstetric anaesthetist will occasionally be confronted with a patient with known coagulopathies requesting relief of pain in labour.

The following case report describes the successful use of patient-controlled analgesia (PCA) fentanyl in such a patient.

Case report

A 61 kg 28-yr-old nulliparous patient presented to the labour floor at 41 wk gestation for induction of labour. The pregnancy was uncomplicated, with the exception of one episode of spotting at 19 wk. The patient had been evaluated by an haematologist during her pregnancy because her sister had a documented abnormality of platelet function which had necessitated transfusions of blood, platelets, and clotting factors after two minor operations. Our patient denied any history of easy bruising or clinical bleeding abnormality, including unusual bleeding with dental extractions, menstruation, or minor trauma. There was no history of previous surgery.

Physical examination was unremarkable. Laboratory evaluation during the pregnancy revealed an abnormality of platelet function. While her bleeding time of 3½ min was normal (simplate method normal <nine minutes), platelet adhesiveness was 31% (normal >40%); platelet aggregation in response to ADP, collagen, and ristocetin was decreased, and there was no aggregation in response to epinephrine. On admission to the labour floor, the platelet count was 243 × $10^9 \cdot L^{-1}$ (normal 150–400 ×

$10^9 \cdot L^{-1}$), prothrombin time 10.5 sec (normal 10–11.8 sec) and partial thromboplastin time 30.5 sec (normal 25–38 sec).

In consultation with the patient's haematologist it was decided, in view of the *in vitro* platelet function abnormalities, and the family history of haemorrhage secondary to abnormal platelet function, that LEA was best avoided. At this time the idea of PCA was presented to the patient, and informed consent was obtained. The patient was then instructed in the use of PCA. Labour was induced by the obstetrician using an *iv* infusion of oxytocin. After 4½ hr the patient's cervix had dilated from 3 to 5 cm, and analgesia was requested. Patient-controlled analgesia was initiated with an *iv* loading dose of fentanyl 50 μg, with the PCA pump set to deliver 20 μg doses of fentanyl, with a lockout period of three minutes. Thirty minutes after initiation of PCA, decreased beat-to-beat variability was noted on the fetal monitor. This resolved quickly with supplemental oxygen and left lateral positioning of the patient. The tracing remained satisfactory for the rest of the labour. Full dilatation was achieved two hours after instituting PCA, when a desmopressin acetate (DDAVP) infusion was started by the obstetrician to maximize platelet function.[2] A second stage of labour of 90 min resulted in the spontaneous vaginal delivery of a live male infant with Apgar scores of nine and nine after one and five minutes. Estimated blood loss at delivery was 450 ml.

The PCA was used for 3½ hr during which the patient self-administered 300 μg of fentanyl, and received a further 50 μg bolus administered by the anaesthetist when the uterine cervix was fully dilated. Throughout her labour the patient experienced no pruritus. In spite of very mild transient nausea and sedation, the patient expressed great satisfaction with her analgesia while using the PCA pump.

Throughout a six-hour observation period in the Neonatal Intensive Care Unit, no apnoea or bradycardia developed in the neonate, who was subsequently transferred to the normal newborn nursery. The neonate received phototherapy for transient hyperbilirubinaemia. After an otherwise uncomplicated course, mother and baby were discharged home on the fourth postpartum day.

Discussion

Lumbar epidural analgesia is contraindicated in the parturient with a bleeding disorder.[1] Such bleeding disorders are not rare. A recent review suggests that 2–3% of the general population may have mild Von Willebrand's disease.[3] Furthermore, 18% of patients with preeclampsia may be at risk because of functional platelet abnormalities or thrombocytopaenia.[4] In spite of this, epidural haematomata as a consequence of LEA are extremely rare.[5] While LEA has been employed successfully in parturients with low platelet counts, it is important to establish that there is no associated platelet dysfunction.[6]

While our patient's bleeding time was normal, the sensitivity, specificity, and predictive value of this test with respect to perioperative bleeding is unknown.[7] In view of the *in vitro* evidence of inadequate platelet function, as well as the family history of perioperative haemorrhage associated with platelet dysfunction, we felt that LEA should be avoided in this patient.

Narcotics have been the most frequently administered analgesics for the pain of labour.[8] More recently, the development of patient-controlled analgesia (PCA) systems has allowed for superior matching of *iv*-administered narcotics to patient's analgesic requirement. This addresses the often considerable inter-patient variability in narcotic requirements. In addition to the excellent analgesia which can be achieved with this approach the patient may receive a lower total dose of narcotics, and benefit from a greater sense of control over her pain management.[9]

The use of PCA in labour is not new. As early as 1976 Evans *et al.* reported the use, in 42 women in labour, of an apparatus designed to deliver intravenous boluses of meperidine on demand.[10] A later controlled study found that PCA meperidine was as effective as larger doses of *im* meperidine in labour.[11] Also in labouring women, PCA nalbuphine was found to be superior both to intermittent boluses of the same drug[12] and to PCA meperidine.[13] Data concerning the outcome of the neonate are generally lacking in these studies.

There has been no report of PCA using fentanyl in labour. However, fentanyl via PCA has been shown to compare favourably with epidural bupivacaine for postoperative surgical patients.[14] Furthermore, fentanyl possesses characteristics which make it an excellent choice of narcotic for PCA in labour. The drug has a rapid onset and short duration of action.[15] In contrast to meperidine, fentanyl is associated with less nausea and sedation in the parturient.[16] As well, fentanyl demonstrates a lack of active metabolites which could depress the neonate.[17–19] We chose a loading dose of fentanyl 50 μg (approximately 1 $\mu g \cdot kg^{-1}$) which has been reported previously to be safe when given as intermittent boluses in labour.[16] Twenty μg bolus doses of fentanyl via PCA have been shown to be effective in the treatment of postoperative pain without decreasing respiratory rate.[20] The three-minute lockout period was chosen to allow fentanyl boluses to exert their effect before allowing the patient access to further narcotic. Using this dosing schedule, our patient remained comfortable, and reported great satisfaction with her analgesia, in spite of self-administering only 300 μg fentanyl. This represents a dose below that previously reported to be safe in labour.[16]

The observed decrease in beat to beat variability on

fetal monitoring during narcotic administration is a well-documented phenomenon.[21] Consequently an isolated observation of decreased beat-to-beat variability in this context requires clinical correlation, and should not necessarily be a cause for obstetric intervention in the course of labour.[21] Nevertheless, because of the known respiratory depressant effects of narcotics, the availability of a pulse oximeter and a narcotic antagonist would be prudent.[21,22]

In this case the newborn maintained an acceptable respiratory rate (>40 breaths · min^{-1}) during the six hours of intensive care observation. Normal neonates have been shown to demonstrate extremely variable fentanyl pharmacokinetic behaviour with the elimination half-life varying between 75–440 min.[23] Neonatal respiratory depression requiring treatment with naloxone has reported after use of fentanyl in labour.[16] Consequently, an intensive observation period of at least six hours is required.

Our case demonstrates that PCA fentanyl may be used successfully to provide analgesia in labour. As with LEA, continuous observation of the parturient, fetal monitoring and the presence of facilities to resuscitate the newborn are mandatory. Careful attention must be paid to respiratory monitoring of the neonate for at least six hours.

Fentanyl delivered by PCA can result in a very satisfied parturient and an active newborn. This approach would be of particular value to patients, such as the one we have presented, in whom LEA is contraindicated.

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