geon, and primary care physician, because the development of symptoms related to the catheter may occur months or years later.

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High Sensory Block after Intrathecal Sufentanil for Labor Analgesia

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INTRATHECAL opioids for labor analgesia have become popular in recent years because they provide rapid, profound analgesia without motor blockade. Several studies[1–3] have found intrathecal opioids safe for both mother and fetus, citing few complications. We report a series of six cases exhibiting a high sensory "block" after intrathecal sufentanil for labor analgesia. With the exception of one patient (case 3), all were healthy parturients in active labor with a term, singleton, vertex fetus. In each case, intrathecal sufentanil was administered as part of a combined spinal-epidural technique. With the patient in the sitting position, the lumbar epidural space was identified using a loss-of-resistance technique with an 18-G Tuohy needle. Intrathecal injection was performed *via* a 120-mm (Sprotte) or 127-mm (Gertie Marx) 24-G pencil-point spinal needle (cases 1–5) or a 120-mm 25-G Quincke needle (case 6) introduced *via* the 18-G needle. Sufentanil, 10 μg, diluted to 1 or 2 ml with preservative-free saline, was injected and the spinal needle withdrawn. A 20-G epidural catheter was threaded into the epidural space. In all cases, painless uterine contractions were achieved shortly after intrathecal injection. In cases 4–6, epidural test doses of 1.5% lidocaine with 1:200,000 epinephrine 3 ml were administered at varying times after intrathecal injection. Cases 1–3 did not receive test doses. Specific details of the cases are described below.

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Case Reports

Case 1

A 26-yr-old multiparous woman, with 9 cm cervical dilatation, complained of itching on her face and inability to swallow 10 min after intrathecal injection. Phonation was normal. Examination revealed a bilateral sensory block to cold and pinprick extending from T3 to S3. Vital signs were unchanged and respiratory efforts were normal. Swallowing ability returned 25 min after injection, and the sensory changes had disappeared at 35 min. Delivery occurred 16 min after intrathecal injection with excellent analgesia, after which the unused epidural catheter was removed.

Case 2

A 30-yr-old nulliparous woman, with 4 cm cervical dilatation, reported facial and lip tingling 10 min after intrathecal injection. Vital signs were unchanged, and there was no swallowing difficulty or respiratory distress. Examination revealed decreased sensation bilaterally to cold over her legs, abdomen, and thorax to a T4 level on the right and V3 on the left. Facial sensory changes began to recede at 45 min and were gone at 100 min when the unused epidural catheter was removed after delivery. Analgesia for delivery was adequate.

Case 3

A 32-yr-old nulliparous woman, with 2 cm cervical dilatation, was obese (104 kg) with mild pregnancy-induced hypertension. She complained of facial and upper arm numbness with difficulty swallowing 25 min after intrathecal injection. Blood pressure and pulse had changed from preblock values of 149/71 mmHg and 59 beats/min to 110/53 mmHg and 70 beats/min, respectively. Respiratory efforts were normal. No therapy was administered. When contractions again became painful 2.5 h after the intrathecal injection, an epidural bolus of 10 ml 0.25% bupivacaine was given, and a continuous epidural infusion of 0.125% bupivacaine was started at 10 ml/h. Delivery was uneventful 8 h after the start of anesthesia.

Case 4

In a 20-yr-old nulliparous woman, with 4 cm cervical dilatation, 35 min after intrathecal injection, an epidural test dose was administered with the intent to follow with a continuous epidural infusion to maintain uninterrupted analgesia. Maternal heart rate remained 55–65 beats/min and systolic blood pressure 120–125 mmHg. There were no symptoms of intravenous injection. After 3 min, a continuous epidural infusion of 0.083% bupivacaine with 0.33 μg/ml sufentanil was started at 12 ml/h. Two min after the infusion was started, the patient abruptly sat upright, clutched her chest, and screamed, "I can't breathe." She became agitated and thrashed around in the bed. The epidural infusion was stopped. Vital signs at the time were as follows: blood pressure 120/82 mmHg, pulse 77 beats/min, and respiration 60 breaths/min. Fetal heart rate was 170 beats/min. On physical examination, she had an unobstructed airway with adequate tidal volume and clear lung fields. Oxygen, 10 l/min, was administered *via* a face mask; Sp_{O_2} was 100%. There was no evidence of a motor block; sensory block was not checked. Arterial blood gas analysis revealed: *p*H 7.40, p_{CO_2} 33 mmHg, and p_{O_2} 320 mmHg. The patient continued to be agitated for 10 min, during which time she complained of a dry throat and inability to swallow and insisted on expectorating her oral secretions. At 15 min, she complained of being sleepy. Her dyspnea and dysphagia resolved after 20 min. To confirm correct epidural catheter placement, a repeat test dose, identical to the first, was given 45 min after the initial dose, again with no change in vital signs or symptoms of intravenous injection. Four minutes later, she again became agitated and complained of dyspnea. Respiratory rate increased from 24 to 32 breaths/min, and she reported that her fingers were tingling. Reassurance was given, and within a few minutes, vital signs and state of arousal returned to normal. Her epidural catheter was removed and, at her request, was not replaced. Painful contractions returned after 3 h, but she refused further analgesia. Her baby was delivered 5 h after the intrathecal injection.

Case 5

Within 10 min after intrathecal injection, an epidural test dose was administered to a 30-yr-old nulliparous woman, with 8 cm cervical dilatation. Heart rate remained 105–110 beats/min, and blood pressure changed from 140/68 (preblock) to 120/55 mmHg. The patient complained of facial "tingling" with no other symptoms. After 45 min, the epidural test dose was repeated without a change in vital signs or subjective symptoms. An infusion of 0.0625% bupivacaine with 0.33 μg/ml sufentanil was started at 12 ml/h. The epidural catheter was used to provide surgical anesthesia during cesarean section 5 h later for arrest of descent of the fetal head without further complications.

Case 6

A 35-yr-old multiparous woman, with 3 cm cervical dilatation, chose a combined spinal-epidural technique because she disliked the feeling of "numb legs" during her previous labor and delivery. To assess epidural catheter position in the event further analgesia was required before delivery, a test dose was administered 5 min after intrathecal injection. Heart rate and blood pressure were unchanged, and there were no subjective symptoms of intravenous injection. Several minutes after the test dose, the patient complained of unilateral facial numbness. Evaluation revealed a sensory block to cold with V3 as the uppermost level. There were no difficulties with swallowing or respiration. The sensory changes resolved within 15 min. No additional analgesics were given, and she delivered her baby 4 h later, with adequate analgesia.

Discussion

Initial reports of the use of intrathecal sufentanil for labor analgesia commented on the absence of motor and sensory changes.[3,4] However, when we introduced the technique into our practice several years ago, many women described altered sensation in their legs after intrathecal sufentanil. In 1993, we reported on 108 patients receiving intrathecal sufentanil as part of a combined spinal-epidural technique for labor analgesia.[2] Segmental sensory "blocks" to cold and pinprick ranging from T4 to S1 occurred in 94% of patients studied and persisted for about 1 h. One patient in the study complained of transient difficulty in taking a deep breath, facial numbness, and inability to swallow. She exhibited decreased sensation to pinprick over her face and could not swallow a sip of water.

The clinical findings in the six patients described here represent extreme cephalad sensory changes after intrathecal sufentanil, the mechanism of which is unclear. Reports of facial sensory changes or documented decreased sensation to cold or pinprick on the face suggest opioid effect on the trigeminal nerve. Difficulties with swallowing were reported in cases 1, 3, and 4. Because

no patient had evidence of a motor block after drug administration, motor weakness as a cause of dysphagia was unlikely. Patients who have received topical sensory anesthesia of their upper airway often complain of dysphagia. Sensory changes in the distribution of the glossopharyngeal nerve after intrathecal sufentanil could alter the normal sensation of swallowing.

Extensive rostral spread of drug must have occurred to produce the observed effects on cranial nerves. Several mechanisms may explain how sufentanil reaches such cephalad central nervous system levels. First, lipophilic opioids undergo rapid rostral spread in the cerebrospinal fluid after lumbar epidural injection[5] and probably do so after intrathecal injection. Second, intrathecal opioid diluted with normal saline is slightly hypobaric at body temperature,[6] and cephalad spread of the drug may have occurred as the patient remained seated for several minutes after injection.

Third, as with spinal anesthesia using local anesthetics, the volume of injectate may influence the level of sensory changes.[7] However, studies comparing intrathecal sufentanil diluted in 1–10 ml of diluent saline have found no differences in sensory levels.[8,9] A fourth possible mechanism is that mechanical changes in the epidural space caused by injection of a volume of liquid could be transmitted to the subarachnoid space.[10] The patients in cases 4–6 experienced symptoms of high sensory "block" shortly after the epidural test dose. Blumgart *et al.*[11] demonstrated that both epidural saline and local anesthetic given after intrathecal injection rapidly produced significant and similar cephalad extension of spinal block for cesarean section, as compared with a control group who received only the intrathecal injection. D'Angelo and colleagues also found that 10 μg intrathecal sufentanil given with 12 ml of epidural saline produced equal or higher median sensory levels to those obtained with 12 ml 0.25% epidural bupivacaine alone.[12] Many anesthesiologists dilate the epidural space with 5–10 ml of saline before threading an epidural catheter to minimize the risk of intravenous catheter placement. This volume of fluid, with or without a test dose of local anesthetic, might raise the level of spinal "block" obtained with intrathecal sufentanil. Lastly, opioids, local anesthetics, and epinephrine have synergistic actions in the spinal cord,[13] and flux of epidural lidocaine and epinephrine from the test dose through the 24-G meningeal hole may have potentiated the opioid sensory blockade.[14]

We considered whether an intravenous injection of local anesthetic might have caused some of the subjective symptoms (*e.g.*, facial tingling) in patients 5 and 6 but found no supportive evidence. None of our patients developed a relative tachycardia or hypertension. Patients 1 and 3 (no test doses) had symptoms with a similar onset and quality to those of patients 5 and 6 (with test doses). In all cases, the duration of symptoms was longer than the usual transient nature of an intravenous local anesthetic injection. Furthermore, successful epidural anesthesia for labor or cesarean section was obtained in cases 3 and 5 without catheter manipulation.

The patient in case 4 complained of dyspnea. Her physical examination (with the exception of tachypnea), oxygen saturation, and arterial blood gas values were all normal. Her dramatic presentation raised concern regarding several serious complications that occur in parturients. Amniotic fluid embolism and pulmonary thromboembolism were considered in the differential diagnosis because of ruptured fetal membranes, oxytocin-augmented labor, and the abrupt onset of dyspnea with tachypnea. Although neither diagnosis could be eliminated with certainty in our patient, the brief duration of symptoms and lack of progression to more serious complications argue against them. Subdural or subarachnoid catheter placement also are unlikely, considering the absence of motor blockade.

Other central nervous system side effects such as sedation and slurred speech have been observed in parturients after intrathecal narcotics.[1] Respiratory depression has been described in a parturient after 15 μg intrathecal fentanyl,[15] and a recent study of female volunteers reported mild respiratory depression after 12.5 or 25 μg intrathecal sufentanil and significant hypoxemia and respiratory depression after 50 μg.[16] Only one of our patients (case 4) complained of respiratory symptoms and sleepiness, prompting the use of an oxygen saturation monitor. In one case not reported here, one of the authors (S.E.C.) administered 0.4 mg intravenous naloxone to a patient with a high sensory "block" after intrathecal sufentanil with no subsequent change in sensory findings.

Sensations of dyspnea, dysphagia, and upper body and facial numbness after intrathecal sufentanil are distressing. Such complaints should be investigated fully for potentially serious complications, such as respiratory depression, airway obstruction, embolic phenomena, or unintentional high spinal anesthesia, and appropriate treatment rendered. The sensory changes we describe were all transient in nature, consistent with the rapid clearance of sufentanil from the cerebrospinal

fluid after intrathecal injection.[17] Once other complications were excluded in our cases, most women responded favorably to reassurance that the symptoms should soon disappear and were unlikely to be dangerous to mother or fetus.

We urge caution when potent intrathecal opioids are administered for labor analgesia. Doses should not exceed the amount shown to be effective (the ED_{95} for intrathecal sufentanil in labor is probably between 7.5 and 11.1 μg[18,19]). Careful monitoring of patients is indicated, particularly in the first hour after injection.

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