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Acute Dystonia by Droperidol during Intravenous Patient-Controlled Analgesia in Young Patients

Patient-controlled analgesia (PCA) is an important means for postoperative analgesia with parenteral opioid. However, postoperative nausea and vomiting (PONV) remains a major problem with a PCA system. Droperidol is used in PCA to prevent PONV. Extrapyramidal reactions by droperidol are, however, occasionally induced. We describe two cases of severe extrapyramidal hypertonic syndrome with an intravenous administration of droperidol in PCA in young patients, following orthopedic surgery.

Key Words : *Analgesics: Fentanyl; Antiemetics: Droperidol; Complication: Dystonia*

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INTRODUCTION

Patient-controlled analgesia (PCA) has become an important means for postoperative analgesia with parenteral opioid. However, postoperative nausea and vomiting (PONV) remains a major problem with a PCA system. Droperidol has been used in PCA in the prevention of PONV (1). Although usually well tolerated, it has been reported to cause extrapyramidal reactions (2-6). The side reactions are reported when droperidol was injected intravenously (3-5), intramuscularly (2), and epidurally (6). A rapidly developing and severe hypertonic syndrome after an intravenous administration of droperidol in PCA is described in two young patients, following orthopedic surgery.

CASE REPORT

Patient 1

A 14-yr-old, 55-kg boy, ASA classification 1, was admitted to our hospital because of a pathologic fracture on the distal radius, left. He was planned to undergo an open reduction with a plate and bone graft from iliac crest for the correction of fracture. The patient received 1.0 mg of midazolam intravenously before anesthesia in the operating room. Interscalene and axillary block were performed with 10 and 20 mL each of 2% lidocaine, 0.5% bupivacaine, and saline in a ratio of 2:1:1 mixed with epinephrine 1:200,000. For a bone graft from the iliac crest, spinal anesthesia was performed with 11 mg of 0.5% bupivacaine (heavy Marcaine®) at the L_{4-5} interspace. Loss of pinprick sensation extended to the T_4 dermatome. During anesthesia, hypotension with bradycardia occurred, and 4 mg of ephedrine and 0.1 mg of glycopyrrolate were administered intravenously. Surgical procedure was uneventful. The total anesthetic time was 2 hr and 50 min. In the recovery room, an initial bolus of 60 μg of fentanyl was injected intravenously followed by 1,340 μg (25 μg/kg) of fentanyl with 2.2 mg (40 μg/kg) of droperidol and 5% glucose in a total volume of 98 mL using a continuous IV infuser, Accufuser PLUS® (basal, 2 mL/hr; bolus, 0.5 mL; lockout interval, 15 min). On postoperative day (POD) 1, at 2 p.m., he vomited several times. The PCA was discontinued and 2 L/min of O_2 was administered via nose. The doses of fentanyl and midazolam infused for 19 hr were approximately 530 μg and 0.9 mg respectively. The symptom was relieved a little thereafter, however he refused further continuous analgegic infusion. His past history revealed no motion sickness. On the other hand, the orthopedic surgeon had already prescribed 10 mg of prophylactic intravenous metoclopramide twice a day, 8 a.m. and 8 p.m., for PONV. Therefore the metoclopramide that had been given before vomiting at 8 a.m. did not work. At 7:30 p.m., we visited him and decided to give another bolus of droperidol. He received 1.0 mg of droperidol intravenously at 8:10 p.m., just 10 min after the second administration of metoclopramide at 8 p.m. Approximately 20 min later, a hypertonic syndrome was developed, presenting as opisthotonus, lateral flexion of the neck, and oculogyric spasms with respiratory difficulty. He said "My extremities are tightened up. My body get rigid and my legs become

flexed spontaneously. I have pains on my arms and legs. I can't close my eyes. My eyes deviate to the left side." His eyes rotated upwards and to the left and seemed fixed in that position, however he could move his eyes on command. Consciousness did not seem to be impaired. Upon questioning, he answered without difficulty in phonation. We consulted a neurologist about his symptoms, and decided to observe him. Approximately 1.5 hr later, the rigidity was somewhat relieved. However, the rigidity of the legs occasionally reappeared over the next 10 hr. The remainder of his postoperative course was uneventful.

Patient 2

A 16-yr-old, 59-kg young patient, ASA classification 1, was admitted because of a triplanar fracture on the ankle by slipping down. He underwent open reduction and internal fixation with plate and screw. The patient received 1.0 mg of midazolam intravenously in the operating room. Spinal anesthesia was performed with 12 mg of 0.5% bupivacaine (heavy Marcaine®) at L_{4-5} interspace. Loss of pinprick sensation extended to the T_{10} dermatome. The entire anesthetic and surgical procedure, which lasted 2 hr and 40 min, was uneventful. In the recovery room, an initial bolus of 50 μg of fentanyl was given intravenously followed by 1,150 μg (20 μg/kg) of fentanyl with 4.7 mg (80 μg/kg) of droperidol and 5% glucose in a total volume of 98 mL using the IV Accufuser PLUS® (basal, 2 mL/hr; bolus, 0.5 mL; lockout interval, 15 min). On POD 0 day, the patient complained nausea, and the PCA was stopped. He was given 5 mg of dexamethasone intravenously and nausea was relieved. Two hours later, the PCA was restarted. On POD 2, no nausea or vomiting was observed. He was asleep but responded to verbal commands. On POD 2, 19 hr after the beginning of PCA, an acute rigidity was developed on the whole body accompanied by grimacing, sweating and dyspnea. Consciousness did not seem to be impaired. After 10 min, an intramuscular injection of 2 mg of midazolam was given to treat the crisis and 3 L/min of O_2 was administered via nasal prong. Thirty minutes later, the symptom was markedly relieved. However, the rigidity on abdomen still persisted. Two hours and thirty minutes later, he was completely recovered from the symptom. The doses of fentanyl and droperidol infused for 17 hr were approximately 400 μg and 1.7 mg respectively. On POD 3, he was discharged without sequelae.

DISCUSSION

Extrapyramidal reactions to droperidol have been classified in three groups (7): 1) acute dystonia, due to a hypertonicity of the regional muscle groups, which involves spasm of muscles of the tongue, face, neck, and back, and may be generalized in forms of opisthotonus, scoliosis, and contractures of the legs. In this case, consciousness is never impaired.; 2) Parkinsonism, which includes bradykinesia, cog-wheel rigidity, mask-like face, and tremor; and 3) akathisia, which can be defined by motor restlessness, such as inability to sit still and constant ambulation.

Patient No. 1 experienced acute dystonia and recovered spontaneously without sequelae. Although other forms exist (5, 6), most extrapyramidal reactions caused by droperidol are of the dystonic type (4). We suggest that the dystonia was induced by the additional bolus injection of 1.0 mg of droperidol on POD 1 with the residual effect of droperidol via PCA from POD 0. Actually, the continuous intravenous infusion of droperidol had been already stopped approximately 6 hr before the event. Droperidol has been reported to have a terminal plasma half-life of about 2 hr (8). The action duration of droperidol lasts about 2 to 4 hr, although the alteration of alertness may last 12 hr or longer (8). The droperidol that had been already infused by PCA might have influenced the occurrence of the attack. The adverse reactions to droperidol are thought to be dose-related, however it do occur at low doses, such as 0.65 mg of IV droperidol in adults (3). Children are more susceptible to the effects of butyrophenones (2).

As droperidol, metoclopramide also has antidopaminergic properties and may induce extrapyramidal tract signs (9). The side reactions of metoclopramide have been reported as akathisia (10-12), although other forms are seen (13, 14). Patient No. 1 received metoclopramide at 8 a.m. on POD 1. There was no evidence of akathisia-like syndrome in the patient. Furthermore, there had been no suspicious signs related to metoclopramide for 12 hr until the crisis developed. Therefore we assume that the droperidol was the major cause of the acute dystonia in the first patient, although the concurrent use of metoclopramide might have played a synergistic role (15).

In patient No. 1, the hypertonic symptoms were noted 20 min after he had received 1.0 mg of droperidol intravenously. Acute rigidity developed 19 hr after the beginning of PCA in patient No. 2. The lapse of time between a single injection or a start of continuous infusion and the crisis is greatly variable from few minutes after intravenous injection (4, 16) to 14 hr after intramuscular injection (2), and the symptoms can occur at any time.

We expected that the extrapyramidal reactions would hardly occur in a continuous infusion of droperidol in PCA compared to the bolus injection. Therefore, in patient No. 2, we administered droperidol only in PCA without additional bolus dose of the drug, although the dose of the drug was two times higher in patient No. 2 than in patient No. 1 instead. The dose of droperidol in patient No. 2 was calculated as 80 μg/kg, whereas the recommended dose of the drug in children is 10-50 μg/kg (17). However, the recommended dose of a bolus are not comparable with the actual dose of a continuous 2-day infusion because of the different administration method. Unexpectedly, acute dystonia also occurred

in patient No. 2.

The treatment of acute dystonia in this clinical situation has varied according to the authors. An intravenous administration of 75 mg of diphenhydramine (Benadryl) was reported to resolve all signs of the extrapyramidal reaction within 1 min (4), while that of 50 mg of the drug resolved symptoms over the next 30 min (3). An intramuscular injection of diazepam 0.16 or 0.17 mg/kg, chlorpromazine 0.4 mg/kg or alimemazine 0.3 mg/ kg successfully treated the crisis (2). In patient No. 1, the symptoms persisted for nearly 12 hr without prescription. Fortunately, the patient was recovered spontaneously without any sequelae. In patient No. 2, however, the reactions subsided within 30 min. This may be because the intramuscular administration of midazolam contributed to the resolution of the attack. Therefore, we suggest that a definite treatment is necessary to terminate the extrapyramidal reactions. Although neither of the patients experienced sequelae, they considered the episodes to be quite distressing.

In summary, it is important to control extrapyramidal reactions even during the continuous infusion of droperidol in PCA, especially in juvenile patients. We have therefore decided to restrict the use and reduce the dose of droperidol in young patients.

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