Acute Dystonia by Droperidol during Intravenous Patient-Controlled Analgesia in Children

—Case report—

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= Abstract =

Patient-controlled analgesia (PCA) is an important means for postoperative analgesia with parenteral opioids. 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 IV administration of droperidol in PCA in two children, following orthopedic surgery. One patient showed a hypertonic syndrome 20 minutes after receiving droperidol 1.0 mg IV and the symptoms persisted for nearly 12 h without prescription. Another patient revealed an acute rigidity 19 h after the beginning of PCA and was treated with an IM administration of midazolam 2 mg successfully.

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Patient-controlled analgesia (PCA) has become an important means for postoperative analgesia with parenteral opioids. 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) intramuscularly,2) and epidurally.6) However, the side reactions have not been reported when droperidol was infused by IV PCA. A rapidly developing and severe hypertonic syndrome after an IV administration of droperidol in PCA is described in two children, following orthopedic surgery.

CASE REPORT

Case 1

A 14-yr-old, 55-kg boy, ASA classification 1, was admitted to our hospital owing to a pathologic fracture on the distal radius, left by trauma. Four months previously, he had been already diagnosed as benign bone cyst of that bone in local clinic. After operation, the frozen section of that bone showed aneurysmal bone cyst. 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 midazolam (Dormicum2) 1.0 mg IV 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 0.5% bupivacaine (heavy Marcaine\textsuperscript{2}) 11 mg at the L\textsubscript{4-5} interspace. Loss of pinprick sensation extended to the T\textsubscript{4} dermatome. During anesthesia, hypotension with bradycardia occurred, and ephedrine 4 mg and glycopyrrolate 0.1 mg IV were administered. Surgical procedure was uneventful. The total anesthetic time was 2 h and 50 min. In the recovery room, an initial bolus of fentanyl 60 \mu g IV was injected followed by fentanyl 1,340 \mu g (25 \mu g/kg) with droperidol 2.2 mg (40 \mu g/kg) and 5% glucose in a total volume of 98 ml using a continuous IV infuser, Accufuser PLUS\textsuperscript{5} (basal, 2 ml/h; bolus, 0.5 ml; lockout interval, 15 min). On postoperative day (POD) 1, at 2 p.m., he vomited several times and showed respiratory distress. The PCA was interrupted, just 19 h after PCA had begun, and O\textsubscript{2} 2 L/min was inhaled via nose. The doses of fentanyl and droperidol infused during 19 h were approximately 530 \mu g and 0.87 mg respectively. Respiratory rate, blood pressure, and heart rate were 24 times/min, 120/90 mmHg, 85 beats/min respectively. Arterial blood gas analysis revealed pH 7.413, PO\textsubscript{2}, 90.0 mmHg, PCO\textsubscript{2}, 41.1 mmHg, SaO\textsubscript{2}, 96.9%. The symptom was relieved a little thereafter, however he refused further continuous analgesic infusion. His past history revealed no motion sickness. On the other hand, the orthopedist 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 to treat residual nausea and to prevent subsequent PONV. He received droperidol 1.0 mg IV at 8 : 10 p.m., just 10 minutes after the second administration of metoclopramide at 8 p.m.. Approximately 20 minutes later, a hypertonic syndrome developed, presenting as opisthotonus, lateral flexion of the neck, and oculocegal 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 cant 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 h later, the rigidity was somewhat relieved. However, the rigidity of the legs occasionally reappeared over the next 10 h. The remainder of his postoperative course was uneventful.

Case 2

A 16-yr-old, 59-kg boy, 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 midazolam 1.0 mg IV in the operating room. Spinal anesthesia was performed with 0.5% bupivacaine (heavy Marcaine\textsuperscript{2}) 12 mg at L\textsubscript{4-5} interspace. Loss of pinprick sensation extended to the T\textsubscript{4-5} dermatome. The entire anesthetic and surgical procedure, which lasted 2 h and 40 min, was uneventful. In the recovery room, an initial bolus of fentanyl 50 \mu g was given IV followed by fentanyl 1,150 \mu g (20 \mu g/kg) with droperidol 4.7 mg (80 \mu g/kg) and 5% glucose in a total volume of 98 ml using IV Accufuser PLUS\textsuperscript{5} (basal, 2 ml/h; bolus, 0.5 ml; lockout interval, 15 min). Until POD 2, no nausea or vomiting was observed. He was asleep but responded to verbal commands. On POD 2, 19 h after the beginning of PCA, an acute rigidity developed on the whole body accompanied by sweating and dyspnea. Consciousness did not seem to be impaired. The doses of fentanyl and droperidol infused until the attack were approximately 455 \mu g and 1.86 mg respectively. After 10 min, an IM injection of midazolam 2 mg was given to treat the crisis and O\textsubscript{2} 3 L/min was administered via nasal prong. Thirty minutes later, the symptom was markedly relieved. Two hours later, he was completely recovered from the syndrome.

DISCUSSION

Extrapyramidal reactions to droperidol have been clas-
sified in three groups: 1) acute dystonia, due to a hypertoncity of the regional muscle groups, that involves spasm of muscles of the tongue, face, neck, and back. It may be generalized in nature, such as opisthotonos, scoliosis, and contractures of legs. Consciousness is never impaired; 2) Parkinsonism, which includes bradykinesia, cog-wheel rigidity, mask-like face, and tremor; and 3) akathisia, which can be defined as 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 are seen, most extrapyramidal reactions caused by droperidol are of the dystonic type. We suggest that the cause of dystonia in this child was the bolus injection of droperidol 1.0 mg on POD 1 with the additive effect of continuous infusion of droperidol by PCA from POD 0. Of course, the continuous infusion of droperidol IV had been already interrupted approximately 6 h before the attack. Droperidol has been reported to have a terminal plasma half-life of about 2 h. The duration of action of droperidol has been reported to last about 2 to 4 h, although the alteration of alertness may last 12 h or longer. The droperidol that had been already infused by PCA might have influenced the occurrence of the attack. On POD 1, he suffered from dyspnea during nausea and vomiting. The cause of dyspnea might be continuous severe vomiting. We suggested that the dose of droperidol infused by PCA until the occurrence of PONV was too small to prevent PONV. Therefore we gave him additional droperidol 1.0 mg IV for PONV. The adverse reactions to droperidol are thought to be dose-related, however it does occur at low doses, such as droperidol 0.65 mg IV in adults. Children are more susceptible to the effects of butyrophenones.

As droperidol, metoclopramide also has antidopaminergic properties and may induce extrapyramidal tract signs. The side reactions of metoclopramide have been reported as akathisia, although other forms are seen. 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 h 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.

In patient No. 1, the hypertonic syndrome was noted 20 min after he had received droperidol 1.0 mg IV. Acute rigidity developed 19 h 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. It may be only a few minutes after IV injection, or 14 h after IM injection or 24 h after epidural infusion. Therefore 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 a bolus injection of the drug. Therefore, in patient No. 2, we administered droperidol only in PCA without additional bolus dose of the drug, although the dose of the drug in μg/kg was twice 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. However, the dose of a bolus and that of a continuous 2-day infusion are not comparable. Unexpectedly, acute dystonia also occurred in patient No. 2.

The treatment of acute dystonia in this clinical situation has varied according to the authors. Diphenhydramine (Benadryl) 75 mg IV was administered with resolution of all signs of the extrapyramidal reaction within 1 minute, while an administration of the drug 50 mg IV resolved symptoms over the next 30 min. An IM injection of diazepam in 0.16 or 0.17 mg/kg, chlorpromazine in 0.4 mg/kg or alimemazine in 0.3 mg/kg successfully treated the crisis. In patient No. 1, the symptoms persisted for nearly 12 h without prescription. Fortunately, the patient recovered spontaneously without any sequelae. In patient No. 2, however, the reactions subsided within 30 min. This may be because the IM 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 children. We have therefore decided to restrict the use and reduce the dose of droperidol in children.

REFERENCES