

CASE REPORTS

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Thrombocytopenia and Subdural Hemorrhage after Desmopressin Administration

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PATIENTS with uremia may have a primary hemostatic defect as a result of abnormal platelet-vessel wall interaction.¹ Desmopressin has been used in patients with acute and chronic renal failure to prevent bleeding before biopsies and major surgery or to stop spontaneous bleeding with apparently good result.² However, mild-to-moderate thrombocytopenia induced by desmopressin has been reported in those with uremia and other diseases.³⁻⁵ We report a case of profound thrombocytopenia with subsequent acute subdural hemorrhage after desmopressin administration.

Case Report

A 48-yr-old, 50-kg woman was hospitalized for abdominal total hysterectomy because of anemia and adenomyosis. She had no known bleeding tendency. Hypertension (blood pressure, 160/90 mmHg), anemia (Hb, 5.6 g/dl), and chronic renal insufficiency (creatinine, 6.5 mg/dl; blood urea nitrogen, 54 mg/dl) were found 5 months previously. Her hypertension was treated with diltiazem, 30 mg, administered twice daily. She had received an outpatient transfusion of 250 ml of packed erythrocytes on May 21, 1997, to manage severe anemia. On May 25, the admission laboratory studies revealed the following values: Hb, 8.4 g/dl; Hct, 25.3%; platelet, 192,000/mm³; prothrombin time (PT), 10.7/12.1 s; partial thromboplastin time (PTT), 23/25.3 s; bleeding time, 4 min; creatinine, 7.0 mg/dl; and blood urea nitrogen, 47 mg/dl. Results of liver function tests were within normal ranges. Blood pressures fluctuated between 124/90 mmHg and 152/100 mmHg, and sublingual nifedipine, 10 mg given every 6 h, was prescribed for hypertension. Packed erythrocytes, 250 ml, were transfused at 3:00 P.M. 1 day before surgery; at 6:00 A.M.,

May 26, the repeated blood count revealed Hb, 9.9 g/dl; Hct, 29.7%; and platelet, 149,000/mm³.

On May 26, the day of surgery, desmopressin, 12 µg, in 100 ml saline solution (0.24 µg/kg) was infused over 1 h (beginning at 10:00 A.M.) at the suggestion of her nephrologist. At 12:30 P.M., general anesthesia was induced with lidocaine, 50 mg; fentanyl, 150 µg; atracurium, 40 mg; propofol, 120 mg; and droperidol, 0.6 mg, intravenously. Nifedipine, 10 mg, was administered *via* nasal mucosa for hypertension after induction. Anesthesia was maintained with 50% oxygen, 50% air, and isoflurane. Blood pressure was kept between 130/80 mmHg and 160/100 mmHg. The procedure ended at 14:00 P.M. uneventfully, and the estimated blood loss was 200 ml. Another 250 ml of packed erythrocytes were transfused during surgery. At the recovery room, she received 50 mg of meperidine for pain relief and sublingual nifedipine, 10 mg, for hypertension. One hour after surgery, she had a full score of recovery and was discharged to the ward.

There were no signs of bleeding except slight hematuria reported 9 h after surgery. She received another 100 mg of intramuscular meperidine and 20 mg of sublingual nifedipine for gradually elevated blood pressure (148/80 mmHg to 200/100 mmHg) without any complaint of headache. At 23:00 P.M., furosemide, 20 mg, was administered intravenously. One hour later, her blood pressure was 170/80 mmHg with heart rate of 84 beats/min. At 1:00 A.M., she began to complain headache, and her blood pressure increased to 210/110 mmHg. Heart rate was about 80 beats/min. Nifedipine, 10 mg, and meperidine, 50 mg, were administered again. One hour later, she began to vomit and became rapidly unconscious, with dilated pupils and absent light reflex. Doll's eye sign was negative. Petechiae and ecchymoses were found over the left arm and under left scapular region. An emergency head computed tomography revealed a large subdural hematoma over right frontal-temporal-parietal area with midline shift and brain herniation. At 3:50 A.M., her latest coagulation profiles revealed the following values: Hb, 9.7 g/dl; Hct, 27.3%; platelet, 45,000/mm³; PT, 22.3/12 s; PTT, 31.1/23.7 s; fibrin degradation product, 10 µg/ml; fibrinogen, 339 mg/dl; and bleeding time was longer than 10 min. The neurosurgeon decided not to proceed emergency craniotomy considering bleeding tendency and poor prognosis of the patient. She remained comatose and died on the third day after surgery.

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Key words: Adverse effects; chemically induced; coagulation; kidney failure.

Discussion

Desmopressin, a synthetic derivative of vasopressin, enhances factor VIII and von Willebrand factor release of the endothelial cells and possibly, platelet function.⁶

The hemostatic effects of desmopressin have been found useful in reducing bleeding in patients with uremia and cirrhosis.^{2,7} Although desmopressin was reported to significantly shorten the prolonged bleeding time in those with uremia without producing serious side effects,² thrombocytopenia^{3,4} and cerebral thrombosis^{8,9} after desmopressin infusion have been observed in those with uremia, indicating this agent may carry the risk of triggering thrombocytopenia or thrombosis. Rydzewski *et al.* observed that platelet counts decreased significantly (average 17%) in 15 uremic patients after desmopressin administration.³ In two subjects, there was nearly a 50% decrease in platelet counts ($-83,000/\text{mm}^3$ and $-97,000/\text{mm}^3$), and bleeding times were not shortened. However, previous vascular events reported after desmopressin were confined to cerebral and cardiac thromboses.⁸⁻¹² No thrombocytopenia with cerebral hemorrhage has been reported after desmopressin infusion.

In this report, the Hb did not decrease, and the fibrinogen and fibrin degradation product levels were normal after subdural hemorrhage, indicating that there was no evident consumption of coagulation factors or other blood loss. Isolated thrombocytopenia can cause spontaneous intracranial hemorrhage,¹³ and patients with acute onset of thrombocytopenia have a higher tendency to bleed than patients with chronic thrombocytopenia.^{14,15} Therefore, we propose that the mechanism of subdural hemorrhage in this patient was most likely related to thrombocytopenia triggered by desmopressin administration.

The mechanism of subdural hemorrhage in this patient was probably multifactorial. Uremic bleeding diathesis with platelet dysfunction and anemia of renal failure were important underlying factors.¹ However, before desmopressin infusion, the bleeding time and the platelet count, the marker of primary hemostasis, were normal. The estimated surgical blood loss was only 200 ml, and no signs of bleeding tendency were present during surgery and postoperative period. The cause of prolonged PT and PTT in this patient was not clear, but fewer than two controlled values of these profiles should not be the major cause of clinical hemorrhage.

There are controversies regarding the safety and effectiveness of prophylactic desmopressin for surgical hemostasis.¹⁶⁻¹⁹ Desmopressin has been documented to be effective for the management and prevention of a spectrum of inherited and acquired platelet dysfunction disorders, such as hemophilia and von Willebrand's disease.⁶

As for the prophylactic use of desmopressin to decrease surgical blood loss and transfusion requirement, although some have suggested this possibility,^{20,21} its effectiveness is not supported by recent surveys.²²⁻²⁵

In view of the case reported here, profound thrombocytopenia is a potential complication of desmopressin treatment, even though desmopressin is used for preventing blood losses in patients with defective hemostatic profiles. Sequential platelet counts and other coagulation profiles should be regularly monitored when using desmopressin. Moreover, it is not justifiable to use desmopressin prophylactically in uremic patients without clinical evidence of hemostatic dysfunction undergoing surgery.

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A Partial Disconnection at the Main Stream CO₂ Transducer Mimics "Curare-cleft" Capnograph

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IN paralyzed and mechanically ventilated patients, normally, the expiratory phase of the capnogram consists of a period of increasing CO₂ followed by a plateau, which lasts until the next inspiration (fig. 1A). A brief inspiratory effort occurring during expiration will result in transient decrease in CO₂ during the plateau phase, an event popularly called a *curare-cleft* (fig. 1B).^{1,2} This decrease may represent gasping caused by pain, hypoventilation, hiccups,³ or an anesthetic machine malfunction.^{4,5} We report here that a partial disconnect of a main stream capnometer also can present as a "cleft" on the expiratory CO₂ wave form during controlled ventilation.

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Key words: Breathing circuit disconnection; capnography.

Case Report

A healthy, 32-yr-old man weighing 64 kg was scheduled for right frontal craniotomy and the excision of meningioma. Anesthesia was induced with intravenous fentanyl (2 µg/kg) and sodium thiopental (5 mg/kg), and muscular relaxation was facilitated with vecuronium bromide (0.1 mg/kg). After tracheal tube placement, the lungs were ventilated with a Anespirator-1300 (ACOMA Inc., Japan) at a tidal volume of 500 ml and a respiratory rate 10 breaths/min using a semi-closed breathing system.

Standard monitors were used. Capnometer (Hewlett-Packard 47201 A; Hewlett-Packard Co., Waltham, MA) was also used, with the main-stream sensor placed between the endotracheal (ET) tube and breathing system. Because the transducer is heavy, adhesive tape was used to secure the connectors between the ET tube, the transducer, and the anesthetic circuit.

After induction of anesthesia, we noticed a "cleft" (a sudden dip in CO₂) during expiratory plateau phase on capnograph. Additional vecuronium (2 mg) was administered. There were no obvious inspiratory efforts by the patient nor did we see the typical negative deflection of the airway pressure gauge. We then noted that ET-CO₂ (42 mmHg) had increased from control (33 mmHg), the peak airway pressure had decreased from 14 to 10 cmH₂O, and expired tidal volume had decreased to 280 ml (from the set 500 ml). A leak in breathing system was suspected and found between the capnograph transducer sensor assembly and the ET tube. Reconnection of the transducer eliminated the leak and restored the capnograph trace to normal in the next exhalation (fig. 1C).