Case Report

Disseminated Intravascular Coagulation Accompanying Thoracic and Abdominal Aortic Aneurysm; Report of Three Cases

Shigeo MAMIYA, Yasuyuki ENDO, Akira B. MIURA, Tomohiro KANAZAWA*, Akihisa KUWAYAMA** and Shigeki NISHIMURA**

We reported three patients who developed disseminated intravascular coagulation (DIC) accompanying thoracic and abdominal aortic aneurysm. The first case, a 26-year-old man with dissecting aortic aneurysm developed DIC with clinical bleeding after operating on glaucoma. The administration of fibrinogen concentrates and antifibrinolytic agent made his DIC improve. The second case, a 70-year-old man with abdominal aortic aneurysm developed DIC showing large ecchymosis after angiography. His DIC disappeared after operation on aneurysm. The third case, a 73-year-old woman with thoracic and abdominal aneurysm developed laboratory-DIC without severe hemorrhagic diathesis. During antifibrinolytic therapy, platelet count, fibrinogen and fibrinogen degradation product (FDP) level improved. Since the treatment of the coagulaopathy might be varied in the situation of the cause and clinical course, it is noted that anti-fibrinolytic therapy was effective in our two cases.

Key Words: Aneurysm, DIC, Antifibrinolytic therapy.

Aortic aneurysm is one of unusual causes of disseminated intravascular coagulation (DIC). Only several cases, in which precise hemostatic studies were performed, have been reported in Japan1-5). The pathogenesis and the method of the treatment of DIC accompanying aortic aneurysm has not been established, because clinical courses and results of the hemostatic abnormalities varies in individual patients. Since we encountered three patients who developed DIC in the course of aortic aneurysm succeeded in treating them, we would like to report of hemostatic studies and effective therapy for this DIC.

CASE REPORT

Case 1. A 26-year-old man with Marfan’s syndrome was admitted to our hospital because of attack of glaucoma on January, 1984. An ophthalmological emergency operation was performed, and postoperative hemorrhage persisted.

Laboratory findings disclosed to the following values; The erythrocyte sedimentation rate was 2 mm per hour. A stool and urine specimen gave a strongly positive test for occult blood. The urinary sediment contained numerous red cells. The serum urea nitrogen and creatinine elevated (Table 1). Hemostatic studies were as follows; 1) a moderate thrombocytopenia (5.6x10^4/μl), 2) decreased plasma level of fibrinogen (59.7 mg/dl), 3) an increase of FDP (64 μg/ml), 4) moderately low level of coagulation factors (FV, 45%, FVII 56% and FXII 32%) and plasminogen (6.3 mg/ml), 5) shortening of euglobulin lysis time (ELT) (2hr) (Table 2). These results and clinical findings were compatible with DIC.

An aortic aneurysm was shown in a chest roentgenogram (Fig. 1). A dissecting thoracoabdominal aneurysm (DeBakey IIIb) was identified by a computed tomographic (CT) scan and digital...
Because of hypofibrinogenemia and slightly increased fibrinolytic activity, fibrinogen concentrated and antifibrinolytic agent (tranexamic acid 1,000 mg daily) were administered with the rapid cessation of bleeding (Fig. 2). Being afraid of persisting hemorrhage from surgical wound, heparin was not chosen. During these therapies, platelet count increased, but hypofibrinogenemia and high level of FDP persisted for relatively long time. Tranexamic acid was discontinued after three months based on the laboratory findings. After the cessation of tranexamic acid, platelet count and fibrinogen level gradually decreased. He was died after ten months, because of rapture of aneurysm.

Case 2. A 70-year-old man was admitted to our hospital because of a pulsating mass in the abdomen, in October, 1983. On admission, the hemoglobin was 8.8 g/dl, blood urea nitrogen and creatinine slightly, elevated (Table 1). An abdo-
In March, 1986. Multiple myeloma (IgG-k, smoldering type) had been diagnosed one year before admission to our hospital. There was a pulsating mass in her abdomen, but no severe hemorrhagic diathesis.

She was found to have dissecting thoracic aneurysm and abdominal athero-sclerotic aneurysm by chest roentgenogram (Fig. 4), ultrasonography, CT scan and angiography. Laboratory data showed proteinuria, mild anemia (Hb 9.9 g/dl), 1,520 mg/dl of serum IgG level and 13% of myelome cells in the bone marrow. Initial hemostatic profile showed normal platelet count (14×10⁴/µl), slightly increased level of FDP (20 µg/ml) and hypofibrinogenemia (106 mg/dl).

Treatment for myeloma with melphalan and prednisolone was initiated. During therapy, platelet count decreased to 7.2×10⁴/µl and the level of fibrinogen to 60 mg/dl rapidly, and FDP level increased to 40 µg/ml. Although severe
hernorrhagic diathesis did not appear, she was treated with Gabexate mesilate (FOY) 1,200 mg daily in spite of melphalan and prednisolon. FOY was discontinued after 3 days because of increased FDP levels, decreased platelet count and fibrinogen level. Therapy was switched to tranexamic acid which resulted in a subsequent decrease of FDP level, increase of platelet count and fibrinogen level. After the cessation of tranexamic acid, platelet count and fibrinogen level gradually decreased, and FDP level increased. Severe hemorrhagic diathesis has not been observed yet (Fig. 2).

DISCUSSION

Fine et al\(^6\) first recognized and reported the association of DIC with aortic aneurysm in 1967. However, the precise mechanisms of hemostatic disorders in these patients are poorly understood. In 1975, ten Cate et al\(^7\) showed that three possible mechanisms leading to the coagulation abnormalities. One mechanism is the activation of factor XII by subendothelial tissues such as collagen. A subsequent activation of the intrinsic coagulation system was initiated. Another mechanism is the activation of factor VII by tissue thromboplastin. The third pathway leading to a coagulation abnormality can be triggered by the fibrinolytic activator activity present in the aortic adventitia. Plasmin formed along this route leads to a proteolysis of the clotting factors and fibrinogen with the formation of FDP. Moreover the exposure of subendothelial aortic tissues has been shown to lead to massive deposition of platelets.

In case 1, it was considered that extrinsic coagulation system and fibrinolytic factors were activated, because of decreased level of FVII, FV and plasminogen, with shortening of ELT. In other two cases, there were no decreased level of coagulation factor and shortening of ELT. The management of the coagulopathy varies in the situation of the cause and the severity of the bleeding. Although supportive treatment consisting of replacing platelets and coagulation factors are helpful, the definitive treatment for DIC is removal of the cause. In our cases, only one patient (Case 2) was operated. His postoperative course was good. He got normalized coagulation status and no further history of bleeding without medication.

Although there was no edivence of markedly increased systemic fibrinolysis (other than a moderately reduced plasminogen level in case 1), antifibrinolytic therapy was administered in two cases (Case 1 and 3). Consumption of platelets was promptly ameliorated in both cases. Postoperative hemorrhage subsided in case 1 and improvement of the levels of fibrinogen and FDP was found in case 3 by this treatment. It is sure the efficasy of antifibrinolytic therapy was observed. Recently similar findings were observed by Bell et al\(^8\) who reported a patients with vascular lesion (Kasabach-Merritt syndrome) in association with a severe consumption coagulopathy and systemic bleeding but with no evidence of significant systemic hyperfibrinolysis. Replacement therapy with cryoprecipitate produced only a transient improvement in the abnormal clotting, but the addition of tranexamic acid resulted in sustained correction. The fibrinolytic component has been considered secondary to localized coagulation and protective against systemic coagulation\(^9\). Otherwise, fibrinolytic activators are present in vascular endothelial
cells and could initiate production of plasmin. Plasmin is capable of activating factor XII, i.e., thus initiating coagulation and even further activating plasminogen. Inhibition of the fibrinolytic limb of coagulation disorders by antifibrinolytic therapy could result in interruption of these interacting and self-perpetuating cascades. In our two patients with dissecting aneurysm (Case 1 and 3), the mechanism of improvement of thrombocytopenia and hypofibrinogenemia during antifibrinolytic therapy might be consistent with these hypothesis. No thrombotic complications were seen in our two patients.

In summary, we reported three patients who developed DIC in the course of aortic aneurysm. In two cases antifibrinolytic therapy and in one case the removal of aneurysm were effective.

REFERENCES