Short Report

New Morphological Findings on Platelets in Bernard-Soulier Syndrome

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Bernard-Soulier Syndrome is characterized morphologically by many giant platelets in the peripheral blood. However, the mechanism of large platelet production has not yet been clarified. Our electron microscopic examinations revealed that some platelets have two or three definite circumferential bundles of microtubules, whereas no pathological findings were obtained in the liberation of platelets from megakaryocytes by light microscopy. From these observations, we consider that the giant platelets of Bernard-Soulier Syndrome are formed by fusion of two or three platelets while they are circulating in the peripheral blood stream.

Bernard-Soulier Syndrome, first reported by Bernard and Soulier (1948), is a congenital disorder of platelet function which is characterized by many giant platelets in peripheral blood, often associated with mild thrombocytopenia and decreased ristocetin- and bovine fibrinogen-induced platelet aggregation. There are several reports regarding the cause of this disease, and some have pointed out a decreased amount of fraction I in the glycoprotein of the platelet membrane. However, why such abnormal platelets are liberated from megakaryocytes is not yet fully explained. This paper reports new morphological findings on large platelets in this disease.

A 30-year-old male was admitted to the First Department of Internal Medicine, Tohoku University Hospital in December, 1978, because of aortic insufficiency and mitral stenosis. Since he had repeated nasal bleeding during admission, he was transferred to the Third Department in May, 1980, to evaluate hemorrhagic diathesis. The screening test for blood coagulability revealed mild thrombocytopenia, giant platelets in the peripheral blood, and decreased ristocetin-induced platelet aggregation. From these hematological findings, the diagnosis of Bernard-Soulier Syndrome was made. He had the aortic valve replacement with transfusion of platelet concentrate prepared by Hemonetics Model-30 at the Department of Thoracic Surgery on June 16, 1980, and his postoperative course was uneventful.

Hematological examinations also showed a prolonged bleeding time, but normal activities of all plasma clotting factors, especially three subunits of factor VIII, procoagulant activity (VIII: C), factor VIII related antigen (VIIIIR:Ag), and platelet co-factor (von Willebrand factor; VIIIIR:WF). The platelet function test indicated normal platelet aggregation and release of ATP induced by ADP, collagen and thrombin by means of a Lumi-Aggregometer. However, the platelet aggregation and release of ATP induced by ristocetin and bovine fibrinogen were markedly decreased. Either content or release of storage-pool ATP and ADP in this patient's platelets was normal, but 5-HT content was slightly higher than

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normal. Polyacrylamide gel disc electrophoresis of platelet membrane in this case showed decreased amount of fraction I in the glycoproteins, that is, a deficiency of negatively charged sialic acid and impaired repelling ability of each platelet. Although mild thrombocytopenia and giant platelets were seen in the peripheral blood, no abnormalities of megakaryocytes in the bone marrow were found by light microscopy.

Electron microscopic examinations revealed some platelets were clearly demarcated into two or three parts by circumferential bundles of microtubules (Fig. 1). Previous investigators have shown some abnormal ultrastructures of platelets in Bernard-Soulier Syndrome. Smith et al. (1973) have reported Swiss-cheese appearance of platelets due to dilatation of an open canicular system. Maldonado et al. (1975) have mentioned disorganization of microtubules. Our findings indicate that the disorganized microtubules had been arranged in a closed circumferential bundle until the platelets fused each other. These findings strongly suggest that giant platelets of Bernard-Soulier Syndrome are formed by membrane fusion of two to three platelets while they are circulating in the peripheral blood stream.

References