

IMPROVEMENT OF THE RHEOLOGICAL PROPERTIES OF BLOOD AS A RESULT OF DIAGNOSTIC APPLICATION OF ULTRAVIST IN THE CASE OF ENDOVASCULAR INTERVENTION IN A PATIENT WITH CHRONIC RENAL INSUFFICIENCY

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It has been shown that the action of a nonionic radiopaque preparation — Ultravist (the total dose of iodine is 112 g) — on a patient with chronic renal insufficiency complicated by relapsing massive gastrointestinal hemorrhage, who was subjected to angiographic investigations and radiological occlusion of the bleeding artery, improved the rheological properties of his blood (viscosity of plasma and the aggregation and rigidity of erythrocytes) and did not cause an overall toxic effect.

It is known that angiographic investigations with the use of modern radiopaque triiodinated preparations have a relatively high polyvalent toxicity; therefore, their application to patients with chronic renal insufficiency is limited [1–3]. At the same time, the action of nonionic radiopaque preparations on patients with chronic renal insufficiency is poorly known, in particular, as far as hemorheology is concerned [4]. The data obtained by us *in vitro* pointed to the fact that nonionic radiopaque preparations have pronounced erythrodierethic properties: they increase the rigidity of erythrocytes, decrease their acidic resistance, and cause stromatolysis [5]. In the present clinical observation, we have revealed a different influence of a preparation of this group (Ultravist-370) on the indices of the blood rheology of patient A., aged 66 (inv/pat 150M-02), who was found in the clinic in the renoprival state complicated by a massive gastrointestinal hemorrhage that was not stopped by the stomach resection on the occasion of the hemorrhagic ulcer and by the application of massive infusions of fresh-frozen plasma and cryoprecipitate. To determine the source of the hemorrhage, we subjected the patient to angiographic investigations of the celiac trunk, the superior mesenteric artery, and the left gastric artery, which required an infusion of about 300.0 ml of the radiopaque preparation added up to 112 g of iodine (1/4 g/kg of the mass), which is 2.8 times higher than the recommended dose. The source of the hemorrhage was revealed in the stump of the stomach and was removed by embolization. Despite the excess over the dose of the radiopaque preparation, we saw no adverse reactions or complications in the patient. Investigations of the rheological properties of the blood were carried out before and within two hours after the infusion of the radiopaque preparation before the next hemodialysis session.

The hemorheological properties of blood (asymptotic viscosity of blood (BV) and plasma viscosity (PV)) were investigated on an AKR-2 rotary viscometer at a temperature of +37°C. The deformability of erythrocytes was determined by the filtration method based on the passage of them through filters with 3- μm pores with the help of an IDA-1 device and estimated by the rigidity index (RI), which is inversely related to the deformability of erythrocytes. The aggregation of erythrocytes (AE) was measured by the photometric method in a Goryaev chamber [6]. Their acidic stability was determined from the parameters of the erythrograms [7].

Significant microhemorheological changes had been revealed in the renoprival patient before the radiopaque investigation (see Table 1): the deformability of erythrocytes was decreased by 64%, their aggregation was increased by a factor of 2.1, and the asymptotic viscosity of the blood was decreased to 2.4 mPa·sec (the control value is 4.0 mPa·sec). Noteworthy was the initially increased (by 39%·min) total acidic resistance of erythrocytes with a relative increase in the number of their high-stability populations. Within two hours after the angiographic investigations we observed an improvement of the microrheological indices: the rigidity of the erythrocytes decreased to their normal value, their aggregation decreased by 17%, and the percentage of high-stability fractions of erythrocytes increased by a factor

TABLE 1. Influence of Ultravist on the Indices of the Hemorheology and Hemolysis of a Patient with Chronic Renal Insufficiency, Subjected to Programmed Hemodialysis

Indices	Control	Before the action of Ultravist	Within two hours after the action of Ultravist
Hematocrit, liter/liter	0.40–0.45	0.23	0.23
BV (asympt.), mPa·sec	4.0±0.18	2.4	2.4
PV, mPa·sec	1.38±0.02	1.4	1.3
RI, conv. units	10–45	74	53
AE, mm	58±4.7	120	97
TR, %·min	608±11.1	647	648
Erythrocytes, %			
low-stability	13.7±2.0	9.5	10.6
moderate-stability	77.1±1.5	75.0	72.9
high-stability	9.2±1.4	15.5	16.5
Maximum of hemolysis, min	6.0±0.2	6.0	6.0
Duration of hemolysis, min	11.0±0.4	12.0	12.0
Free hemoglobin, mg/dl	<7	6.8	20.5

of 1.8 in comparison with the control value. As is well known, the suberythrodiereithic processes observed in the early period after the infusion of the radiopaque preparations cause an insignificant hemodilution, improve the fluidity of the blood, enhance the regeneration of the erythron and tissues, and activate the immune response.

Thus, unlike the ionic radiopaque preparations that increase the blood viscosity and the aggregation of erythrocytes and cause "spontaneous hemolysis" [1], the nonionic radiopaque preparations not only produce no general toxic reactions, but they can also improve the rheological properties of blood at the microcirculation level despite the fact that in the absence of the excretory function of the kidneys they are used in a significantly increased dose, which leads to a prolonged exposure of the ultravist molecules with the plasma and the form elements of blood. Unlike the experiments *in vitro* pointing to significant membrane-toxic changes in the erythrocytes, the clinical results of application of nonionic radiopaque preparations, along with the problems calling for further detailed study, make it possible to introduce corrections into the limitations on the application of the optimum doses of preparations of this group in the case of chronic renal insufficiency and transplantation of kidneys.

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