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TITLE : EFFECT OF BLOOD TRANSFUSION ON PLASMA FIBRONECTIN

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Introduction. Plasma fibronectin (PFN) is an opsonically active glycoprotein (normal plasma concentration 300-400µg/ml). It is reported to have a major role in maintaining reticuloendothelial cell host defenses during episodes of sepsis associated with major surgery, burns, or trauma. [1] Since PFN is known to bind to fibrinogen-fibrin complexes 2, it has been suggested that the microaggregate debris contained in stored blood may lower in vivo levels of PFN after transfusion [3]. To answer this question,we measured PFN levels in patients receiving 2 units of blood through either a standard 170µ screen filter, or a depth-type microaggregate blood filter.

Methods. Sixty (60) outpatients with a diagnosed malignancy who required transfusion for anemia were studied. Informed consent was obtained from each patient, and the protocol was approved by the Human Investigation Committee. Patients were randomized at each visit to receive blood through a standard 170µ screen filter (Group I), a 20µ microaggregate depth filter-Fenwal 4C2131 (Group II), or a 10µ microaggregate depth filter-Sorenson-Swank ATS-F10 (Group III). As a means of monitoring the effect of infusing red cells alone on levels of PFN, a control group received saline-washed red cells (Group IV). All blood transfused was collected in citrate-phosphate-dextrose from volunteer donors. To minimize infusion of donor fibronectin,all units were transfused as packed red blood cells. Blood was stored at 1-6°C for at least 12 days prior to infusion. None of the packed cell units were centrifuged prior to being released to the clinic. The pretransfusion samples were obtained immediately prior to blood infusion and the posttransfusion samples were obtained within 1 hour after the last unit was infused. All blood samples were drawn into vacuum collection tubes containing sodium citrate. After collection the blood was centrifuged and the platelet poor plasma was frozen at -80°C until testing. None of the patients received any chemotherapy or intravenous injections until after the posttransfusion sample was collected. PFN was measured using an electroimmunoassay. Values were expressed as mean± SEM. Significance ($p<0.05$)was determined by Student's t-test for paired groups and the Wilcoxon rank-sum test.

Results. Compared to pretransfusion concentrations of PFN, a statistically significant fall in posttransfusion values was seen only in Group I ($p<0.05$). The mean decrease in PFN concentration seen after transfusion in Group I (41µg/ml) was significantly different ($p<0.05$) from the 8µg/ml seen for the control group which received saline-washed red cells (Group IV). There was no difference found between the washed cell group (IV) and either of the microaggregate filter groups (II and III), for the mean percentage drop in posttransfusion PFN concentration ($p>0.05$).

Discussion. Infusion of the microaggregate and fibrin debris present in 2 units of stored blood can produce a fall in the in vivo levels of PFN. Infusion of saline-washed red cells,which have the least amount of contaminating debris, appear to be most effective in preventing this drop. Use of microaggregate blood filters, however, seem to provide comparable protection. To evaluate the effect of transfusion alone on levels of PFN, only individuals receiving elective blood transfusion were entered into the study. Use of an outpatient population as opposed to acutely ill inpatients minimized the influence of clinical conditions such as infection which by itself is known to lower in vivo levels of PFN. Based on our data, infusion of the microaggregate and fibrin debris present in multiple units of stored blood could markedly lower concentrations of PFN. While the importance of maintaining levels of PFN in critically ill patients is currently under study, Scovill et al., have published data suggesting that such patients may benefit from infusion of fibronectin in the form of cryoprecipitate [1]. Should such a practice become accepted as a useful treatment modality, it would be desireable to insure that optimal concentrations of PFN are maintained at all times. When administering blood to critically ill patients, transfusion of saline-washed red cells, or use of microaggregate filters would minimize the amount of PFN lost by binding of the opsonic glycoprotein to the microaggregate and fibrin debris contained in the transfused blood. This would insure maximum availability of PFN for opsonization of bacteria or other types of circulating particles by the reticuloendothelial system. If maintaining high levels of PFN is shown to be of value in treating critically ill patients, removal of the microaggregate debris from any blood transfusions required by these patients would appear to be warranted.

References.1. Scovill WA, Saba TM,Blumenstock FA, et al: Opsonic α_2 surface binding glycoprotein therapy during sepsis. Ann Surg 188:521,1978.
2. Mosher DF: Cross-linking of cold-insoluble globulin by fibrin-stabilizing factor. J Biol Chem 250: 6614, 1975.
3. Saba TM, Jaffe E: Plasma fibronectin (opsonic glycoprotein): its synthesis by vascular endothelial cells and role in cardiopulmonary integrity after trauma as related to reticuloendothelial function. Am J Med 68:577,1980.

TABLE 1. PFN CONCENTRATION (µg/ml) Mean± SEM

	GROUP			
	I	II	III	IV
N	20	10	10	20
Pre-Tx†	433± 56	338± 86	391± 42	342± 29
Post-Tx††	392± 54	321± 98	376± 48	334± 27
% drop	9.4%	4.9%	4.1%	2.3%
p	<0.05	NS	NS	NS

† pretransfusion concentration of PFN
†† posttransfusion concentration of PFN