Evaluation of Blood Microfilters

To the Editor:—I have read with great interest the study of Dr. Cullen and his colleagues about microfiltration of blood. Their results achieved with the newer Bentley® and Fenwal® filters are in good correlation with earlier reports. I, however, wish to comment on certain points concerning this investigation:

1) The amount of blood microaggregates was determined by the “screen filtration pressure” (SFP) method. The pressure transducer used had a limit of 500 torr. However, some of the measurements were extrapolated from curves obtained up to several thousand torr. I wonder whether this is acceptable as SFP curves seldom are straight lines.

2) Three- to six-week-old blood was used to test the filters. As the composition of aggregates in aged blood has not as yet been studied in detail, I feel that they are not comparable with the aggregates described in blood less than three-weeks-old which is used clinically.

3) Individual blood units contain varying amounts of aggregates. In this study erythrocyte concentrates were used. Their aggregate content may be even more variable because of the preparation process whereby plasma is partly withdrawn from the units. Moreover, centrifugation of blood greatly affects the total amount of aggregates and their particle-size distribution. Therefore, the number of individual blood units transfused cannot be correlated to the flow rate of blood. Neither can filtration of erythrocyte concentrates be compared with whole blood microfiltration.

4) The authors for no apparent reason discarded the standard 170-µm filter after a single use. Doing so increases the total cost, making it comparable with the cost of a single microfilter.

5) Dr. Cullen and his co-workers conclude that, “fine screen filtration is safe.” On the basis of their study, I believe it is not possible to draw such a conclusion. Because of the high hematocrits of the red-cell concentrates used, plasma volumes were inadequate to permit measurement of plasma hemoglobin—a measure of red-cell destruction. Occlusion of the filters by debris has in fact repeatedly been found to cause hemolysis during pressure transfusion, but the degree of hemolysis that would be harmful to the patient remains unknown.

6) The authors’ reference to two studies state that, “there is considerable evidence to suggest the potential harmfulness of microaggregates” but that, “it is not known whether these small particles (12.7–25.4 µm diameter) constitute a pulmonary threat compared with larger particles.” To my knowledge there is at least one recently published work showing that microfiltration with the 40-µm filter has no significant protective effect on pulmonary function in humans. Although differences in opinion exist, I feel that no justifiable conclusion can be made until the more efficient filters have been tested clinically during massive transfusions.

7) The authors use erythrocyte concentrates in almost all transfusions. In this case, a simple method to deal with the microaggregate problem is to remove the “buffy coat” as well (in the blood bank) during the preparation process and replace the plasma with saline containing adenosine and glucose. Such a product would contain only a small amount of aggregates.

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References


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