Conclusion

No specific therapy is available in the fat embolism syndrome. Fuchsig *et al.*[26] have emphasized the importance of early diagnosis and immediate supportive treatment of shock. The infusion of low-molecular-weight colloids has been recommended on the assumption that normal blood viscosity can be restored by these substances.[2,-20, 27] A 5% alcohol infusion has been advocated on the grounds that it may dissolve or emulsify fat emboli.[28] The use of heparin is largely due to its well-known lipid clearing factor;[29, 30] however, no lessening of the hemolytic process is to be expected.[31]

Résumé

Un second cas d'association d'embolie graisseuse et d'anémie hémolytique est décrit après traumatisme osseux. La pathogénie de l'hémolyse au cours de l'embolie graisseuse est discutée. Certains lipides, dont la lysolécithine, semblent jouer un rôle primordial dans l'apparition de ce syndrome.

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SHORT COMMUNICATION

The effects of blood donation on serum iron and hemoglobin levels in young women

R. M. SCHAFFRIN, M.D., J. W. THOMAS, M.D. and T. D. STOUT, M.D., *Vancouver, B.C.*

It is recognized that the iron balance of the adolescent menstruating female is very precarious at the best of times. This is so because of an increased iron requirement due to growth and menstruation aggravated by a relatively iron-deficient diet. The total storage iron in a healthy non-iron-deficient female varies between 200 and 400 mg.[1] The first sign of a negative iron balance is a reduction of the iron stores. Thereafter the body increases iron absorption in an attempt to repair the deficit. Only after the iron stores are exhausted does the serum iron fall.[1] Thus one may infer absent or severely reduced iron stores from a low transferrin saturation.

Seibold *et al.*,[2] in West Germany, studied 1066 healthy women over the age of 14 years for evidence of iron deficiency by means of serum iron binding capacity, iron absorption and hemoglobin determinations. About 13.9% of their subjects were anemic and 26.7% had reduced iron stores on the basis of both an increased iron binding capacity and an increased iron absorption. The incidence of reduced iron stores was highest in the group between 15 and 20 years. Since many of the blood donors in British Columbia fall into the latter group, we wanted to determine to what extent a single blood donation would affect the iron stores and hemoglobin.

R. M. SCHAFFRIN, M.D. and J. W. THOMAS, M.D., Department of Pathology, Vancouver General Hospital, and Department of Medicine, University of British Columbia, Vancouver.
T. D. STOUT, M.D., Canadian Red Cross Blood Transfusion Service, Vancouver.
Reprint requests to: Dr. R. M. Schaffrin, Department of Pathology, Vancouver General Hospital, Vancouver 9, B.C.

Materials and methods

We measured the serum iron, iron binding capacity, per cent saturation and hemoglobin of 40 healthy high-school girls from the Greater Vancouver area who had given their first and only blood donation during the previous four to eight months. None of these girls had received iron therapy during the preceding year and none had had any blood loss other than menstrual. The average interval between donation and blood sampling was six months. For the control group, we chose 50 healthy girls who were applying for admission to the School of Nursing, and who had neither donated blood nor received any iron medication previously. The mean age of the donors was 17.6 years with a range of 17 to 18 years, while that of the control

TABLE I
Serum iron parameters and hemoglobin values

	Donor	*S.D.*	*Non-donor*	*S.D.*
Number in the group	40		50	
Mean age of the group (years)	17.6		17.7	
Mean serum iron (μg.%)	84	37	112	55
Mean iron binding capacity (μg.%)	435	92	368	45
Mean transferrin saturation (%)	20	8.5	31	14
Mean hemoglobin (g.%)	13.3	0.66	13.6	0.77

group was 17.7 years with a range of 17 to 22 years.

Blood was taken into Venojet vacuum blood tubes and allowed to clot. The serum iron was estimated by the method of Young and Hicks.[3] The hemoglobin was measured by a routine cyanmethemoglobin method on blood drawn into an EDTA tube.

Results

The mean serum iron of the donors was 84 μg. per 100 ml. in contrast to a mean value of 112 μg. per 100 ml. for the non-donors. The mean serum iron binding capacity of the donors was above normal, while the mean transferrin saturation was below normal. The corresponding mean values of the control subjects were within normal limits (Table I). The distribution of the transferrin saturation values varied significantly between donors and non-donors. Only 8% (4/50) of the controls had a saturation less than 15%, whereas 33% (13/40) of the donors had a transferrin saturation less than 15% (Table I).

TABLE II
The effect of blood donation on transferrin saturation

	Transferrin saturation		
	<15%	*15-29%*	*>29%*
Donors	33%	54%	13%
Non-donors	8%	52%	40%

The mean hemoglobin values of the two groups are similar and within normal limits. Student's t for the difference in hemoglobin values is 2.84, which for 39 degrees of freedom gives a P value of 0.005. Therefore the difference is significant statistically. One donor and two non-donors had hemoglobins of less than 12 g. per 100 ml.

Discussion

As 60% of the non-donors had a serum transferrin saturation below 30%, the iron balance in this age group of females is indeed precarious. It is easy to see how a single blood donation (constituting some 225 mg. of iron) would exhaust their already marginal iron stores. From our figures (Table II) it would appear that 25% of the donors were depleted of their storage iron to such an extent that their serum transferrin saturation dropped to below 15%.

A statistical analysis of the differences in the mean serum iron parameters revealed that these differences were highly significant (Table III).

Fielding, Karabus and Brunstrom[4] in England, in a study of 24 healthy male blood donors who had given a mean of 2.2 donations per year, found that 10 (41%) were depleted of storage iron. On the basis of these findings they concluded that blood donations should be limited to twice a year in men and once a year in women, and suggested prophylactic iron therapy for all blood donors.

Our findings certainly support the latter two recommendations of Fielding and his colleagues. We would recommend that all women receive one 300-mg. tablet of ferrous gluconate daily for two months after each donation.

TABLE III
Statistical significance of the difference in means

	Donors	*Non-donors*	*Probability*
Mean serum iron (μg.%)	84	112	0.0005
Mean iron binding capacity (μg.%)	435	368	0.0005
Mean transferrin saturation (%)	20	31	0.0005
Mean hemoglobin (g.%)	13.3	13.6	0.005

Summary

Among 40 high-school girls who had given their first and only blood donation, 13 (33%) had serum transferrin saturation values below 15% four to eight months later. Among 50 age-matched controls only four (8%) had serum iron values in the deficiency range. The mean transferrin saturation of the donors was 20%, whereas that of the controls was 31% with a P value of 0.0005 for this difference. There was little difference in the hemoglobin values of the two groups.

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