Enhanced Platelet Aggregation and Membrane Biocompatibility: Possible Influence on Thrombosis and Embolism in Hemodialysis Patients

P.		Simon
K.S.		Ang
G.		Cam

Nephrology and Hemodialysis Unit, La Beauchée Hospital, Saint-Brieuc, France

P. Simon, MD, Nephrology and hemodialysis Unit, La Beauchée Hospital, F-22000 Saint-Brieuc (France)

Dear Sir,

We were very interested in the paper of Vieneret al. [1] confirming the enhanced in vitro platelet aggregation in hemodialysis patients. These authors stressed in the last years several clinical works have underlined the frequent episodes of thrombotic and thromboembolic events in hemodialysis patients and this tendency appeared to be less marked when drugs that depress platelet function we administered. In vivo studies have demonstrated enhanced platelet activity in this population.

Recently, the interactions between platelets and dialysis membranes have been studied. It was suggested that platelet activation during hemodialysis was associated with complement activation during hemodialysis in a manner similar to dialysis-associated neutropenia [2]. Compared to Cuprophane (CUP) membranes, non-CUP membranes such as polyacrylonitrile membranes showed the least amount of complement activation [3]. Extracor-poreal circulation of blood through a polyacrylonitrile membrane (AN69) resulted in less aggregation than a similar procedure with CUP [4]. So, more or less strong interactions of these platelet dialysis membrane in population undergoing long-term hemodialysis could explain the more or less frequent episodes of thrombotic and thromboembolic events.

Since 1975, we used two major types of dialysis membranes in respect of criteria of biocompatibility: CUP and AN69 membranes. We report the results of the retrospective study which was undertaken to investigate the possibility of difference in thrombosis and thromboembolic events in patients treated with either membrane.

We have studied 171 patients (102 males, 69 females) who have been hemodialyzed in our unit from 1975 to

1985. A group of 60 patients (41 M, 19 F) was treated with CUP only. Another group of 36 patients (17 M, 19 F) was treated with AN69 only. A third group of 75 patients (44 M, 31 F) was treated with both membranes. In this latter group, we were able to distinguish the patients with the following sequence: CUP-AN69-CUP (10 M, 7 F) or AN69-CUP (17 M, 3 F) and those with the following sequence: AN69-CUP-AN69 (4 M, 7 F) or CUP-AN69 (13 M, 14 F). The dialysis schedule consisted of 4-hour treatment three times a week.

The incidence of arteriovenous fistula thrombosis was studied with the first membrane used (table I). We found a significant difference in the incidence of fistula thrombosis in the first year

of hemodialysis treatment between the patients treated with CUP membrane and those treated with AN69. The influence of the change of membrane was also studied (table II). The change of membrane significantly increased (AN69-CUP) or decreased (CUP-AN69) the occurrences of thrombosis.

Table I. First membrane used incidence of A-V fistula thrombosis and duration of hemodialysis (HD) treatment

Years on HD treatment	Patients treated with	Patients with A-V fistula thrombosis
-----------------------	-----------------------	--------------------------------------

* $p < 0.01$ by the χ^2 test. The groups were similar in respect of age, sex, mean duration of hemodialysis, primary renal disease.

Membrane Biocompatibility and the Risk of Thrombosis in Dialysed Patients

173

Table II. Groups treated with both membranes influence of the change of the dialysis membrane on the risk of A-V fistula thrombosis

CUPa	AN69b	p value	AN69b	CUPa	p value
Duration of HD treatment, mean $\pm$ SD, months	34 $\pm$ 28		29 $\pm$ 22	0.58	32 $\pm$ 19
Number of occurrences of thrombosis	41	2	0.6 $\times 10^{-5}$	53	30
Number of patients with thrombosis	20(37)	1(1.8)	< 0.01	2(4.2)	18(38)

The p value was calculated by the Wilcoxon test. (Duration of HD treatment, Number of occurrences) or by χ^2 test (Number of patients with thrombosis). Figures in parentheses are percentages. a n = 54 (26 males, 28 females); mean age 47 $\pm$ 13 years. b n = 47 (30 males, 17 females); mean age 45 $\pm$ 15 years.

During the period of study, clinical data and angiographic criteria in favor of lower limb thrombosis occurred in 1 patient treated with AN69 and in 8 patients treated with CUP. In 5 patients, the death was due to pulmonary embolism. In 3, the diagnosis was confirmed by autopsy. In another 2 patients, the evolution was not fatal and the diagnosis was made in respect of clinical, hemodynamic and/or angiographic data. All these patients were hemodialyzed with CUP at the time of diagnosis or death. This retrospective study suggests that the biocompatibility of a dialysis membrane such as AN69 could reduce the risk of thrombosis and thromboembolism in uremic patients undergoing long-term hemodialysis. The less marked platelet activation with AN69 could account for these clinical data. Nevertheless, only a prospective study could confirm this hypothesis.

References

- Viener, A.; Aviram, M.; Better, O.S.; Brook, J.G.: Enhanced in vitro platelet aggregation in hemodialysis patients. *Nephron* 43: 139–143 (1986).
- Hakim, R.M.; Schaffer, A.I.: Hemodialysis-associated platelet activation and thrombocytopenia. *Am. J. Med.* 78: 575–579 (1985).
- Hakim, R.M.; Fearon, D.T.; Lazarus, J.M.: Biocompatibility of dialysis membranes: effects of chronic complement activation. *Kidney int.* 26:94–100 (1984).
- Adler, A.J.; Berlyne, G.M.: Beta-thromboglobulin and platelet factor 4 levels during hemodialysis with polyacrylonitrile. *Am. Soc. artificial internal Org. J.* 4: 100–102 (1981).