Title : HEMOSTASIS MODIFICATIONS OBSERVED IN THORACO-ABDOMINAL ANEURYSM SURGERY

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INTRODUCTION. Although massive coagulopathy and bleeding are to be feared during thoraco-abdominal aneurysm (TAA) repair, only few studies have investigated the blood coagulation disorders in this setting. Disseminated intravascular coagulation (DIC), graft replacement, hepatic dysfunction induced by supracoeliac clamping and hemodilution have been suggested as the possible causes of the coagulation defects (1). Fresh Frozen Plasma and Platelet infusion have been proposed to prevent bleeding disorders but the usefulness of such a treatment has not been established.

The aim of this preliminary study was to determine the variations in hemostasis during TAA surgery. Fresh Frozen Plasma and/or Platelet were avoided unless uncontrollable bleeding occured.

METHODS. Patients. 8 consecutive patients (mean age 56) scheduled for TAA surgery were included in this study after approval by our Ethics Committee. None of them had hepatic disease. Preoperative treatment included : calcium blockers (n=2), beta blockers (n=2).

Anesthetic and surgical management. After premedication, radial artery and Swan-Ganz catheters were inserted. Anesthesia was induced with a benzodiazepine, fentanyl, pancuronium and maintained under mechanical ventilation with N2O 50 % in O2 and isoflurane. Blood pressure was controlled during surgery and thoracic aortic cross-clamping by increasing the inspired concentration of isoflurane. Ringer Lactate (RL), Human Serum Albumin (4 %) (HSA 4 %), blood bank packed red cells, autologous red cells (Cell Saver®) were infused according to the patient hemodynamics of hematocrit (Hct). The surgical procedure consisted of Dacron® graft replacement of the diseased aorta without a cardiopulmonary by-pass or shunting technique and without heparin administration. Mean duration of the cross-clamping was 41 ± 4 minutes.

Hemostasis study. Blood samples were drawn at the following times : T0 : before anesthesia ; T1 : 30 min after aortic unclamping ; T2 : first postoperative day ; T3 : fifth postoperative day. They included : serum protein level, Hct, Platelet count (Plt), Partial Thromboplastin Time (PTT) and Prothombin Time (PT) (Chronometric Methods Organon), Fibrinogen (Fg) (Clauss Method Stago), Antithrombin III Ag, C and S Protein (CP and SP) (Laurell Electro Immuno Assay, Stago), Plasminogen (Radial-immuno diffusion Stago), Ethanol test (Godal Method), Fibrin Split Products (FSP), D-Dimers (D-Di test Stago), Tissue Plasminogen Activator (tPA-Ag) (ELISA Stago) Plasminogen Activator Inhibitor (PAI) (Amidolytic Assay Stago). All data were expressed as mean ± SEM and analyzed using two way ANOVA.

RESULTS. Central temperature was 33.6±0.3°C at T1 and 36.7±0.6°C at T2. From the begining of surgery until 30 min after unclamping, fluid infusion consisted of RL 4062±602 ml, HSA 4 % 1337±351 ml, bank red cells 1.63±1.2 U, autol. red cells 3.9±1.4 U. During this period, blood loss was 2193±652 ml and urinary output was 752±163 ml. Hemostasis parameters are reported in table 1.

Table 1 :

	CONTROL	POST-UNCLAMPING	1th POSTOP DAY	5th POST DAY
Serum proteins ($g.l^{-1}$)	51±1	36±2*	40±2*	47±3
Hct (Vol %)	38±1	30±3*	28±1*	31±2*
Plt_9 ($10^9.l^{-1}$)	232±23	143±31*	109±25*	192±36
PTT (s)	34±2	92±12*	47±4	44±6
PT (% vs control)	89±2	45±7*	59±5*	80±10
Fg ($mg.10^{-1}.l^{-1}$)	393±30	187±34*	278±46*	713±76*
C Protein (%)	118±19	50±9*	47±7*	82±16*
S Protein (%)	105±8	57±7*	56±7*	89±113*
AT III (%)	88±6	47±7*	45±7*	82±7
Plasminogen (%)	97±7	46±6*	50±5*	100±12
FSP ($mcg.ml^{-1}$)	< 10	21±9	12±2	10±2
D-Dimers ($mcg.ml^{-1}$)	0.75±0.2	1.1±0.2	2.7±1.4*	1±0.3
tPA ($ng.ml^{-1}$)	6±1	11±1	10±2	9±2
PAI ($IU.ml^{-1}$)	7±1	4±1	37±9*	5±2

* $p < 0.05$ vs control

The coagulation disorders are maximal after the aorta is unclamped. The ethanol test was negative throughout the study. Significant increase in D-Dimers and PAI was noted the first postoperative day.

One patient suffering from breast cancer died at the end of the surgical procedure with incontrollable bleeding at the graft site, despite FFP and Platelet administration. No preoperative (T0) or peroperative (T1) results was predictible of this issue.

DISCUSSION. All patients presented intra and postoperatively a severe hemodilution as evidenced by a marked drop in Hct, serum proteins, Plt, PT, PTT, Fg, etc ... The significant increase in D-Dimers seen in first postoperative day reflects a slight DIC which was clinically unsignificant. Excluding an intraoperative death, none of our patients developed any clinically significant hemostatic complication. This interesting finding highlights the possibility that, although a definite coagulation disorder, as evidenced by our results, exists in this setting, it may not necessarily be as clinically important as one thought. The question of the usefulness of FFP and Platelets in this setting is also raised.

REFERENCES

1. COHEN JR et al : Ann Vasc Surg 1 : 552-557, 1987