

Changes in Blood Coagulation and Fibrinolysis Systems after Hassab's Procedure for Portal Hypertension

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ABSTRACT

The changes in the coagulation and fibrinolysis systems in 12 patients on whom Hassab's procedure was given for portal hypertension with liver cirrhosis (LC) were studied. The coagulation factors such as the platelet count, prothrombin time (PT) and fibrinogen level showed reduction before operation, while after operation these values showed significant increase. Whereas the fibrinolysis, the fibrinogen degradation products (FDP) showed no positive cases before operation, but after operation a significant rise was noted on the 7th day as the peak. It was observed from these findings that Hassab's procedure given on the cases with LC induced acceleration in the coagulation and fibrinolysis systems after operation, so that ample care should be taken for the complications including disseminated intravascular coagulation (DIC) or gastrointestinal bleeding.

So many complications including acute gastric mucosal lesion (AGML) have been found after operation in patients having liver disorders such as LC or obstructive jaundice. So far, the authors^{1-3,6)} have been reporting on their clinical and experimental studies concerning the mechanism of onset of AGML. In the present study, the changes in the coagulation and fibrinolysis systems in patients on whom Hassab's procedure (Splenectomy, paraesophagogastric devascularization, and pyloroplasty) was given for portal hypertension with LC, were studied, and some interesting findings were obtained.

MATERIALS AND METHODS

Twelve patients on whom Hassab's procedure was given in our department for the period from January 1984 to March 1985 were made the subjects. Their ages ranged from 37 to 63 (the mean 50.8 years). The basic disease was LC in

all of them, which was confirmed by liver biopsy performed during operation. The mean bleeding volume during operation was 1310 ± 600 ml (mean \pm SD), and the mean volume of blood transfusion was 1040 ± 610 ml. After the operation, 2030 ± 780 ml of the fresh frozen plasma (FFP) was given to all patients.

The liver function tests, serum amylase level, platelet count, PT, active partial thromboplastin time (APTT), fibrinogen level, and FDP were determined.

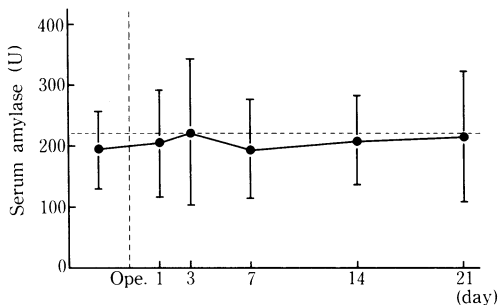
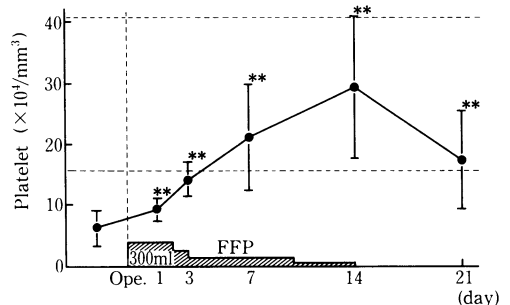
RESULTS

Table shows the results of the liver function tests performed before operation. In the Table we can observe the reduction in cholinesterase, total cholesterol, and KICG, and rise in GOT, GPT, γ -GTP, TTT, and ICG_{R15}.

As shown in Fig. 1, the changes in serum amylase level did not show a significant rise after operation in comparison with that before

Table Liver function tests before operation

	Normal	Mean \pm S.D.
T.Bil.	0.5–1.0	1.0 \pm 0.4 mg/dl
GOT	8–40	63 \pm 26 u/liter
GPT	0–40	56 \pm 26 u/liter
LDH	240–530	325 \pm 69 u/liter
Ch-E	175–440	160 \pm 47 u/liter
Al-ph.	40–120	99 \pm 26 u/liter
LAP	20–55	53 \pm 15 u/liter
γ -GTP	0–63	76 \pm 43 u/liter
T.Prot.	6.5–8.0	7.2 \pm 0.6 g/dl
Alb.	3.1–5.0	3.6 \pm 0.4 g/dl
TTT	0–4	4.4 \pm 2.8 u
T.chole.	150–230	141 \pm 27 mg/dl
ICGR ₁₅	0–10	34 \pm 16 %
K	0.158–0.232	0.081 \pm 0.033

**Fig. 1.** Change in serum amylase level**Fig. 2.** Change of platelet count

operation.

The platelet count showed a rise (Fig. 2) from the first day after operation, and reached the peak on the fourteenth day after operation. PT showed a significant rise (Fig. 3) on the third day after operation, and thereafter it was gradually decreased to a value nearly that of before operation. On the other hand, APTT (Fig. 4) showed a shortening tendency at an early date

after operation, but no significant difference was noted. While the fibrinogen level (Fig. 5) began to show a significant rise on the third day after operation.

As shown in Fig. 6, FDP began to show a rise from the first day after operation and reached the peak on the seventh day, showing a gradual decrease thereafter.

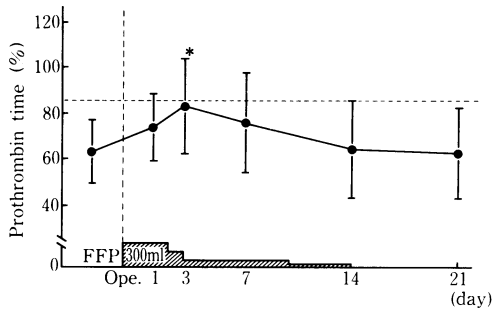


Fig. 3. Change of prothrombin time

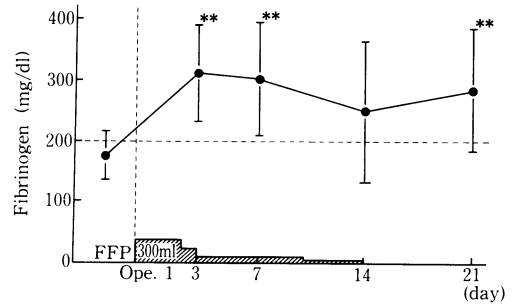


Fig. 5. Change of fibrinogen level

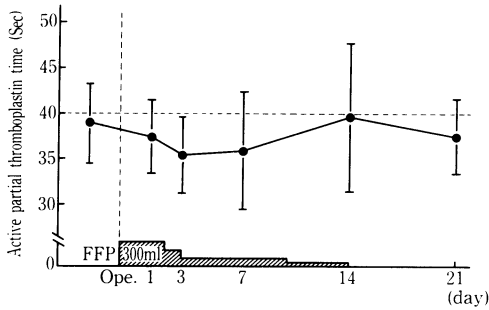


Fig. 4. Change of active partial thromboplastin time

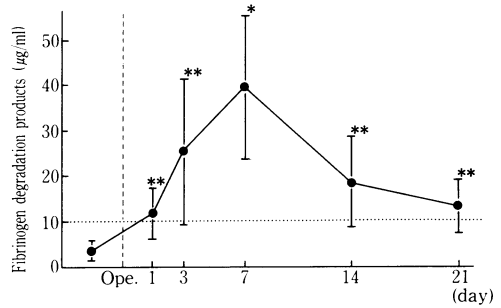


Fig. 6. Change of fibrinogen degradation products

DISCUSSION

The reduction in the coagulation factors was noted in patients with LC. For the causes of the reduction, the decrease in the production capacity of the coagulation factors as well as the acceleration of the destruction of the coagulation factors by hypersplenisms are considered. The majority of patients with LC indicated for surgical treatment are at the compensatory stage, and the reduction in the coagulation factors may be mostly due to hypersplenisms, and this suggestion can be estimable from the changes in the coagulation factors (Fig. 2—5) after operation. As is natural with the state after giving Hassab's procedure (Splenectomy), the improvement of the coagulation factors is observable. According to the results obtained by the authors, fibrinogen level reached the peak within 7 days, and the platelet count, within 14 days, respectively, and during the time within 14 days af-

ter operation, the patients were in a state of hypercoagulability.

The FDP, the fibrinolytic factor rose after operation and reached the peak on the seventh day (Fig. 6). As to the acceleration of the fibrinolytic activity in patients with LC, there have been many controversies, whether it was primary or secondary. The authors examined the acceleration of the fibrinolytic activity after giving Hassab's procedure, and came to a presumption that it might be a secondary acceleration on account of the following three reasons: 1) All patients with LC were at the compensatory stage, and no acceleration of the fibrinolysis system before operation was found in any of them. 2) Prior to the acceleration of the fibrinolysis system after operation, hypercoagulability existed. 3) In Hassab's procedure, paraesophagegastic devascularization was given for collateral routes, so that blood stasis was induced in the

portal vein, and patients were in a state of easily forming thrombus. In other words, it is presurable that after Hassab's procedure a preparatory state for DIC expressed as the pre-DIC, compensated DIC⁴⁾ and localized DIC⁵⁾ had been formed.

As a result of the author's studies²⁾ of patients with LC on whom Hassab's procedure was given, it was clarified that AGML occurred in high incidence after operation, and that the majority of AGML occurred by the seventh day after operation. This finding has made good agreement with the timing of the changes in the coagulation and fibrinolysis systems found in the present study. In the experimental study made by the authors^{1,3)} concerning the mechanism of onset of AGML, it was found that the gastric mucosa in patients with hepatic failure was in a state of the decrease of the gastric mucus, destruction of the microvasculature and of the increase on vasoactive amines. It was presumed that the perigastric devascularization was in a state of the congestion of the gastric mucosal vessels and the decrease in the mucosal blood flow, and that splenectomy easily induced the acceleration of the coagulation and fibrinolysis systems and formation of thrombus in the portal vein. Consequently, the gastric mucosa at the time of LC was in a state of the reduction in defensive factors, and that the acceleration of the coagulation and fibrinolysis systems after giving Hassab's procedure might have a possibility of closely associated with the mechanism of onset and aggravation of AGML.

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