Increased platelet aggregation (over)compensates effects of thrombocytopenia in patients undergoing orthotopic liver transplantation.

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Introduction: Liver transplantation patients often present with thrombocytopenia, increased von Willebrand factor, and decreased ADAMTS13 “a disintegrin-like and metalloproteinase with thrombospondin type-1 motifs 13” concentrations (1-3) but the net effect on primary haemostasis is unknown. We hypothesized that platelet aggregation is increased in liver transplantation.

Method: Following ethics committee approval, platelet aggregation was determined (impedance aggregometry; Multiplate ®) using the activators ristocetin, ADP, arachidonic acid, collagen, and thrombin receptor activating peptide (TRAP) in 37 liver transplant patients (at 4 time points during anaesthesia) and in 10 controls (patients scheduled for minor surgery and without liver disease or previous liver surgery). Platelet concentration was assessed by using a Coulter counter. The correlation of platelet aggregation and concentration was also evaluated. Statistics: Student t-test for independent samples.

Results: In vitro (n=8), there was a strict correlation between platelet concentration and their aggregation ($r=0.91 \pm 0.07$, $p=0.0001$). In liver transplant recipients, platelet concentration was decreased compared to controls ($114 \times 10^3 \text{ mm}^{-3}$ vs. $225 \times 10^3 \text{ mm}^{-3}$, $p=0.0001$), but ristocetin induced aggregation was markedly increased (101.8 AU vs. 56.9 , $p=0.02$). Correction of the assay for platelet concentration revealed a 3-fold increase in ristocetin-induced aggregation ($0.95 \text{ AU}/10^3 \text{ platelet mm}^{-3}$ vs. 0.27 , $p=0.0001$). Absolute ADP-, arachidonic acid-, collagen-, and TRAP induced platelet aggregation did not differ from the respective control values without correction for platelet count. After normalization for platelet concentration, however, evoked platelet aggregation was markedly increased with all these activators (by 67-156 %, $p<0.05$). At the end of liver transplant surgery, platelet concentration in liver transplant recipients had increased from 119 ± 9.7 to 168 ± 18.4 (mean $\pm$ standard error, $n=31$ and 25 resp., $p=0.03$) whereas normalized platelet aggregation using ristocetin, ADP, arachidonic acid, collagen, and TRAP was decreased (normalized!!), see below.

- Platelet concentration was significantly lower in liver transplantation patients (n=37) than in control patients (n=10), ($p = 0.0001$).

- Ristocetin evoked aggregation was significantly greater in liver transplantation patients (n=35) than in control patients (n=10), ($p = 0.01$).

- Ristocetin, ADP, ASPI, Collagen and TRAP evoked aggregation after correction for platelet concentration was significantly greater in liver transplantation group (n= 35) than in control group n = (10).

- Platelet aggregation is decreased (normalized!!) at end of surgery with all platelet activators.

Conclusion: Platelet aggregation is markedly increased in liver transplantation recipients but normalizes towards the end of surgery. While increased platelet aggregation in liver recipients can potentially compensate for thrombocytopenia, it might also favour thrombotic complication.

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