

Lebererkrankung
&
perioperatives
Gerinnungsmanagement

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Leberkranke haben ein erhöhtes perioperatives Risiko

- Weil sie verbluten?
 - Sepsis - MOV

Gerinnungssynthese

Table II. The liver is responsible for the synthesis of all coagulation factors.

Proteins with pro-coagulant effect	Proteins with anti-coagulant effect
Fibrinogen	AT*, PC*, PS*
FII, FVII, FIX, FX, FXI, FXII	TFPI*
FV*, FVIII*	Plasminogen
PAI-1*	
α_2 -antiplasmin	
TAFI	

Gerinnungslabor

There is currently no evidence to support the use of routine coagulation tests to predict bleeding or thrombotic risk in liver disease, but emerging global coagulation assays, such as thrombin generation and TEG, may have a future role in this area.

Risikofaktoren

- Vitamin K Mangel
- Infektion
- Nierenversagen

- Voroperation
- Thrombozytopenie

Thromboserisiko

- 2 x erhöht bei Lebererkrankung (Soogard 2009)
 - Erhöht nach Leberresektion
 - Erhöht nach LTX – Leberarterie!

Wann soll ich „präemptiv“ substituieren ?

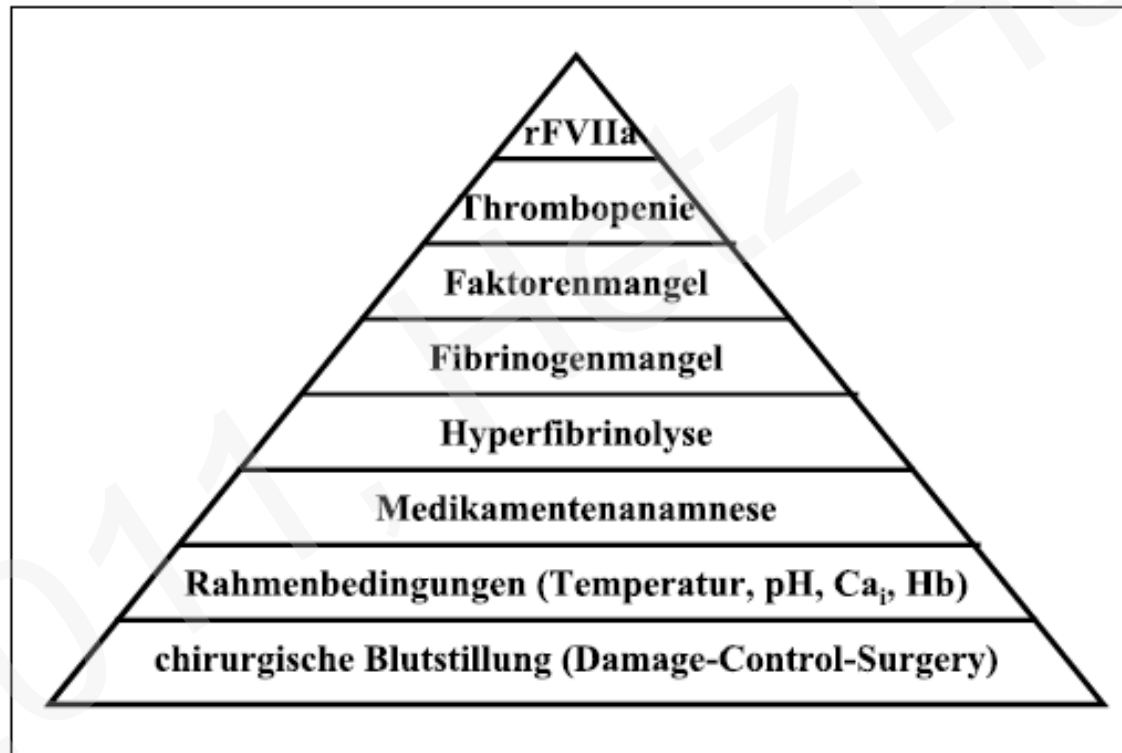
Paracentesis and central venous access can be undertaken safely even in the presence of coagulopathy and thrombocytopenia (McVay & Toy, 1991; Fisher & Mutimer, 1999) and bleeding post-liver biopsy is not predicted by abnormal laboratory markers (Segal & Dzik, 2005).

OP ?

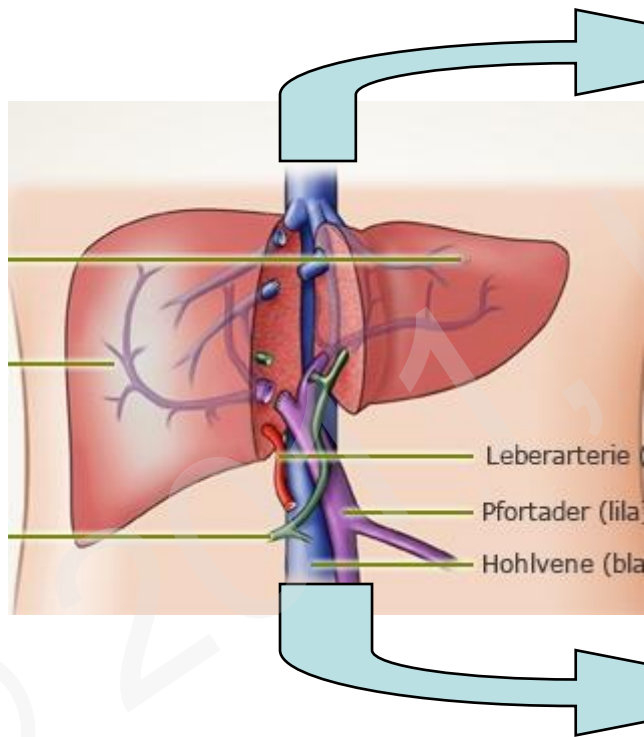
Intraoperative Blutung

- Auch bei Leberkranken gilt:
 - Chirurgisch
 - „mechanische“ Faktoren
 - Andere physiologische Faktoren
 - Gerinnungsübel

Stufenschema



Zentralvenöser Druck

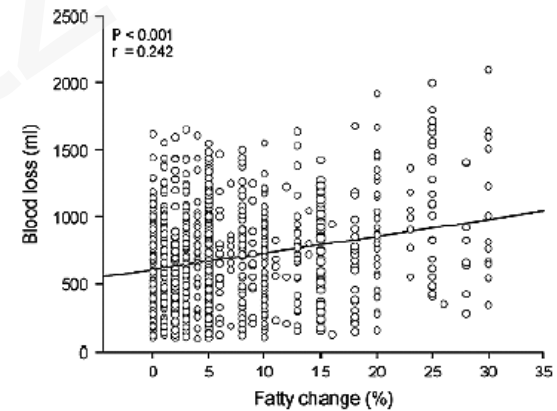
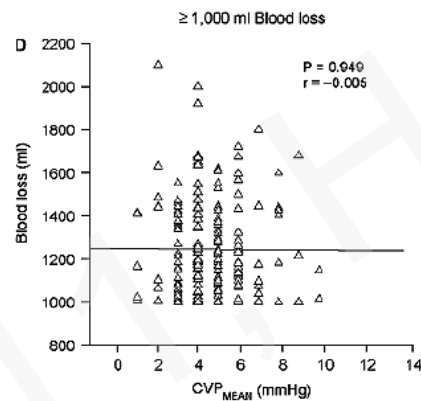
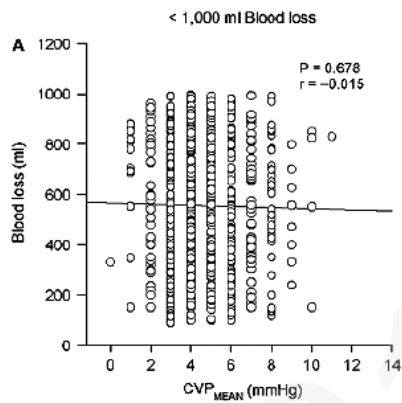


Venöses Blutvolumen senken

- „Hypovolämie“
- Pumpleistung erhöhen

Fluß in der subhepatischen
Cava drosseln

Association between central venous pressure and blood loss during hepatic resection in 984 living donors



Blutverlust & Inotropie

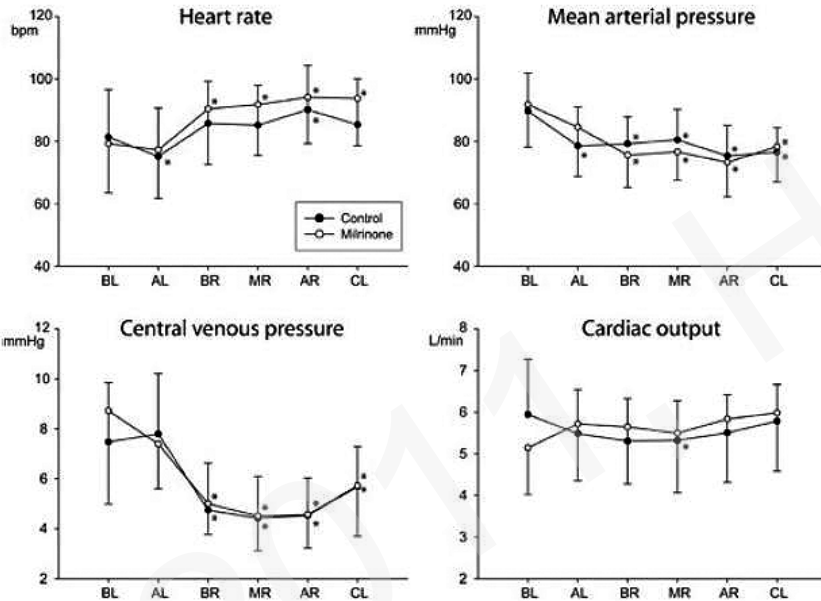


Table 4: Intraoperative data

Group	Control (n = 19)	Milrinone (n = 18)
Estimated blood loss (mL)	378 ± 167	142 ± 129*
Duration of anesthesia (min)	309 ± 33	312 ± 30
Duration of surgery (min)	265 ± 25	263 ± 33
Duration of graft resection (min)	67 ± 15	71 ± 20
Infused fluids (mL)	1966 ± 607	2045 ± 497
Urine output (mL)	853 ± 408	228 ± 108*
Donors requiring furosemide	18/19	1/18*
Donors requiring ephedrine	9/19	8/18
Dose of ephedrine (mg)	6.3 ± 8.1	2.2 ± 2.6*

Portalvenöser Druck/Fluß

- TIPSS
- Propranolol
- Somatostatin-Analoga
- Vasopressin-Analoga

Akute Normovolämische Hämodilution

TABLE 5. Intraoperative and Overall Transfusion Data for All Patients

	ANH (n = 63)	STD (n = 67)	<i>P</i>
Allogeneic RBC transfusion (Total)			0.067
Patients	8 (12.7%)	17 (25.4%)	
Units*	28	47	
Allogeneic RBC transfusion (Intraoperative)			0.036
Patients	1 (1.6%)	7 (10.4%)	
Units*	2	12	
FFP transfusion (Total)			0.14
Patients	11 (17.5%)	19 (28.4%)	
Units*	50	114	
Any transfusion			0.13
Patients	14 (22.2%)	23 (34.3%)	
Units*	78	161	

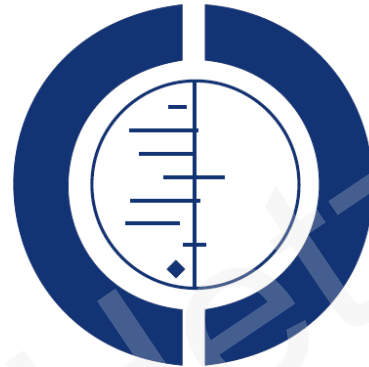
*Refers to total number of units per arm.

TABLE 6. Intraoperative and Overall Transfusion Data for Patients With an Estimated Blood Loss ≥ 800 mL

	ANH (n = 33)	STD (n = 29)	<i>P</i>
Allogeneic RBC transfusion (Total)			0.045
Patients	6 (18.2%)	12 (42.4%)	
Units*	24	35	
Allogeneic RBC transfusion (Intraoperative)			0.013
Patients	1 (3%)	7 (24%)	
Units*	2	12	
FFP transfusion (Total)			0.025
Patients	7 (21.2%)	14 (48.3%)	
Units*	32	94	
Any transfusion			0.025
Patients	9 (27.3%)	16 (55.2%)	
Units*	56	129	

*Refers to total number of units per arm.

Cardiopulmonary interventions to decrease blood loss and blood transfusion requirements for liver resection (Review)



**THE COCHRANE
COLLABORATION®**

None of the interventions seem to decrease peri-operative morbidity or offer any long-term survival benefit. Haemodilution shows promise in the reduction of blood transfusion requirements in liver resection surgery.

Tranexamsäure

TABLE 3. Postoperative Results

	Group A (n = 108)	Group B (n = 106)	<i>P</i>
Surgical complication (total no.)	14	17	0.564
Ascites	5	5	
Intra-abdominal abscess	6	8	
Bile leak	4	6	
Wound infection	2	3	
Colon perforation	1	0	
Pleural effusion	1	2	
Overall blood loss (mL)	300 (30–2100)	600 (40–3410)	0.0001
Blood loss in liver transection (mL)	190 (20–1910)	450 (30–2590)	0.004
Blood loss of other procedures (mL)	105 (10–450)	190 (10–1500)	0.032
Need for blood transfusion	0	17	<0.0001
Operation time (hr)	4.23 (1.51–11.8)	5.10 (3.38–12.10)	0.003
Overall inflow occlusion time (min)	28.8 (0–130)	34.6 (0–148)	0.012
Liver transection time (min)	32.5 (5.5–148)	37.0 (8.0–162)	0.011
Liver transection area (cm ²)	49.5 (8.8–148)	51.5 (10.5–150)	0.528
Resected liver weight (g)	208 (18–2250)	220 (15–2600)	0.529
Postoperative hospital stay (days)	8 (5–48)	9 (6–58)	0.341
Hospital cost (U.S. dollars)	5126 (2572–19358)	6342 (3318–22476)	0.036

Pharmacological interventions to decrease blood loss and blood transfusion requirements for liver resection (Review)



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None of the interventions seem to decrease peri-operative morbidity or offer any long-term survival benefit.

Aprotinin and tranexamic acid show promise in the reduction of blood transfusion requirements in liver resection surgery.

Blutprodukte

- Erhöhte Infektionsrate
- „Cancer Recurrence“
 - TRALI
- Verfügbarkeit/Kosten
 - Gut wirksam!

Prothrombinkomplex, Fibrinogen

- Schnell verfügbar
- Wenig Volumen
- Keine Daten zu Effektivität und Sicherheit
- Cave DIC & Thrombose! (Kohler 1999)

Faktor VIIa

- Daten zu Leberbiopsie, LTX, Leberresektion, Varizenblutung
- Normalisierung der Prothrombinzeit
 - Nicht weniger Transfusionen
 - Cave Thrombosen

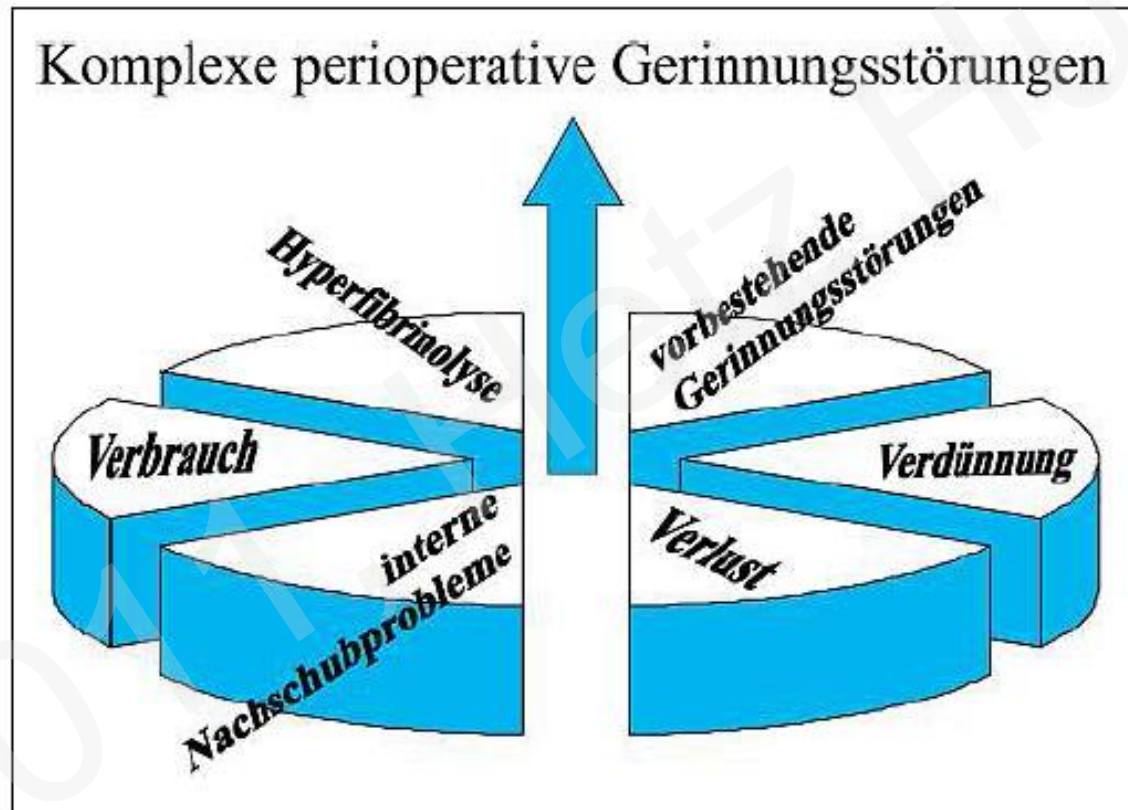
DIC & Blutung

- FFP
- Fibrinogen
- Thrombozyten (<10 bzw <50)

Antikoagulation für extrakorporalen Kreislauf

- Unbedingt antikoagulieren!
- Heparin / Flolan möglich (Faybik)
- Citratmetabolismus verzögert (Kramer)
- Regionale Citrat-Antikoagulation möglich mit engmaschiger Anpassung (Faybik)

Pathophysiologie



Conclusio: Vorbereitung

- Vitamin K
- Tranexamsäure
- Hämodilution

Conclusio: intraoperative Blutung

- Füllungsdrucke
 - Temperatur
 - Azidose
 - Hämoglobin
- Tranexamsäure, Faktoren, FFP
Thrombos, Faktor VII a

Take Home

- Gerinnungsanalysen kritisch interpretieren
 - An erhöhtes Thromboserisiko denken
 - Strenge Indikationsstellung
 - Keine übertriebene Angst vor Blutprodukten

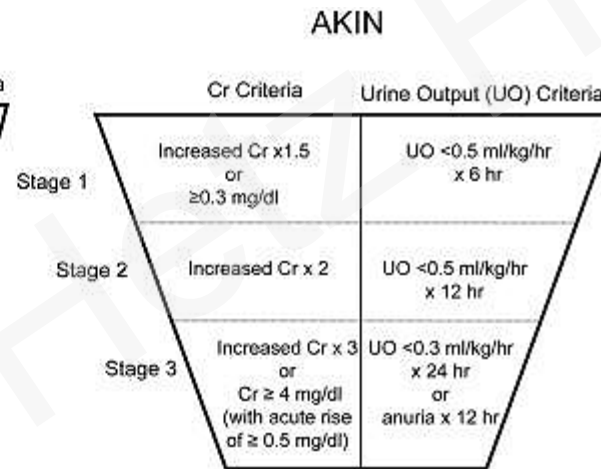
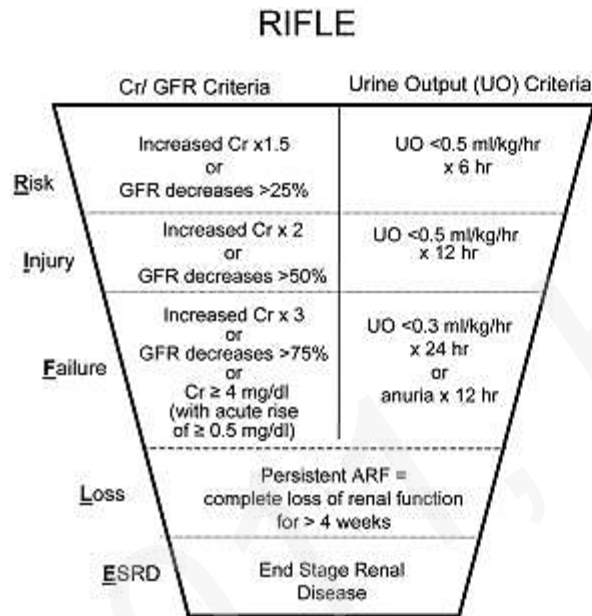
Intensivtherapie

- Rasche Extubation
- Keine „antibiotische Abschirmung“
 - Cave „Überwässerung“
- Thromboembolieprophylaxe

Bei Problemen:

**Proaktive Suche nach „behebba-
ren Ursachen“**

Oligurie?



840 ml/d

Patients who receive renal replacement therapy (RRT) are considered to have met the criteria for stage 3 irrespective of the stage that they are in at the time of commencement of RRT.

Was ist mir wichtig

- Vernünftige Volumengabe
- Evtl. ANH bei Blutungsrisiko
 - Tranexamsäure
- Liberale Transfusionstrigger
 - Individuelles Vorgehen
- Intensive Kommunikation mit Operateur/In

Prospective Validation of the “Fifty-Fifty” Criteria as an Early and Accurate Predictor of Death After Liver Resection in Intensive Care Unit Patients

PTZ < 50%, Bilirubin > 50 mmol/l (> 3 mg/dl)

TABLE 3. Causes of Death in ICU

Patients	Causes	Delay of Death (d)	50–50 Day 3	50–50 Day 5
1	Liver failure, multiorgan failure	6	Yes	Yes
2	Hepatic outflow obstruction, liver failure	6	Yes	Yes
3	Liver Failure, multiorgan failure	11	Yes	Yes
4	Liver failure	12	Yes	Yes
5	Hemorrhagic shock, sepsis, multiorgan failure	49	Yes	Yes
6	Hemorrhagic shock, multiorgan failure	7	No	Yes
7	Portal thrombosis, liver failure, pneumonia, MARS	8	Yes	Yes
8	Biliary peritonitis, late onset liver failure	46	No	No
9	Late onset liver failure, pneumonia, multiorgan failure, MARS	62	No	No
10	Hemorrhagic shock, multiorgan failure, MARS	37	No	No

MARS indicates liver assist device.