Impact of intrapulmonary vascular dilatations and hepatopulmonary syndrome on the clinical course of patients after transjugular intrahepatic portosystemic shunt insertion

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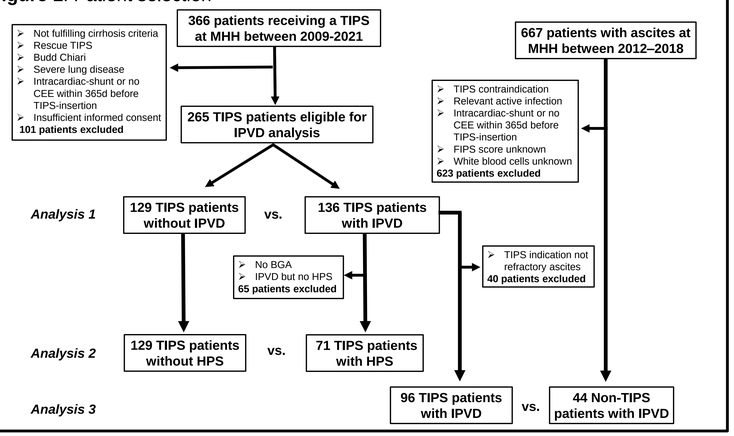
Introduction & Aims

- Implantation of a transjugular intrahepatic portosystemic shunt (TIPS) is an established therapy of cirrhosis related complications such as refractory ascites or variceal bleeding.
- In this setting, data regarding the impact of TIPS implantation on the clinical course of patients with intrapulmonary vascular dilatations (IPVD) and hepatopulmonary syndrome (HPS) are scarce.
- Some authors suggested that TIPS insertion might exacerbate the hyperdynamic circulatory state that is present in patients with advanced liver disease and could therefore result in a higher incidence of hepatic or cardiac decompensation.
- This study aimed to investigate the impact of IPVD and HPS on the clinical course of patients that underwent TIPS implantation.

Methods

- Overall, 366 consecutive patients who received a TIPS between 2009 and 2021 were considered for this study. **(Figure 1)**
- Contrast-enhanced echocardiography (CEE) and blood gas analysis (BGA) were conducted to diagnose IPVD and HPS.
- Patients were followed up for two years after TIPS-insertion and analyzed endpoints were liver transplant (LTx)-free survival, hepatic decompensation (HD) (one year) or cardiac decompensation (CD) (one year).
- Endpoints were analyzed using multivariable competing risk, adjusting for refractory ascites as TIPS indication and the FIPS score **(Analysis 1+2, Figure 2 & 3)**
- In a last analysis, patients with TIPS and IPVD were compared with patients with IPVD that did not underwent TIPS implantation **(Analysis 3, Figure 4)**

Figure 1: Patient selection



Results

Table 1: Baseline characteristics of *IPVD vs. No IPVD* patients

	IPVD n=136 (51.3)	No IPVD n=129 (48.7)	p-value
Sex: female (n, %)	52 (38.2)	55 (42.6)	0.47
Age at TIPS-Insertion (years)	58.1 ± 10.5	59.9 ± 10.3	0.16
Aetiology of Liver Cirrhosis			
ASH (n, %)	85 (62.5)	75 (58.1)	0.47
NASH (n, %)	21 (15.4)	16 (12.4)	0.49
Viral (n, %)	10 (7.3)	17 (13.2)	0.16
Cryptogenic (n, %)	17 (12.5)	18 (14.0)	0.86
Other (n, %)	18 (13.2)	13 (10.1)	0.45
Child stage			
B (n, %)	107 (78.7)	108 (83.7)	0.29
C (n, %)	14 (10.3)	11 (8.5)	0.68
MELD	12 ± 4	13 ± 4	0.06
FIPS	-0.29 ± 0.79	-0.10 ± 0.71	*0.047*
Indication for TIPS †			
Refractory Ascites (n, %)	105 (77.2)	116 (89.9)	*0.005*
Variceal bleeding (n, %)	39 (28.7)	20 (15.5)	*0.010*
Other (n, %)	9 (6.6)	7 (5.4)	0.80
Sodium (µM/L)	134 ± 5	135 ± 5	0.13
Creatinine (µM/L)	107 ± 53	132 ± 83	*0.004*
Bilirubin (µM/L)	22 ± 14	20 ± 16	0.33
White blood cells (10^3/µL)	5.77 ± 2.9	6.3 ± 3.7	0.17
Platelet count (10^3/µL)	124 ± 71	138 ± 79	0.14
E/A (N<1)	49 (39.5)	56 (50.9)	0.080
E/A (N>1.5)	17 (13.7)	13 (11.8)	0.67
PO2 (mmHg)	80.0 ± 14.9	85.9 ± 16.7	*0.009*
PCO2 (mmHg)	33.0 ± 5.4	33.4 ± 5.0	0.60
AaPO2 (mmHg)	28.8 ± 14.9	85.9 ± 16.7	*0.004*

Table 2: Baseline characteristics of *HPS vs. No HPS* patients

	HPS n=71 (35.5)	No HPS n=129 (64.5)	p-value
Sex: female (n, %)	32 (45.1)	55 (42.6)	0.74
Age at TIPS-Insertion (years)	58.6 ± 10.2	59.9 ± 10.3	0.40
Aetiology of Liver Cirrhosis			
ASH (n, %)	46 (64.8)	75 (58.1)	0.36
NASH (n, %)	14 (19.7)	16 (12.4)	0.21
Viral (n, %)	2 (2.8)	17 (13.2)	*0.021*
Cryptogenic (n, %)	7 (10.0)	18 (14.0)	0.51
Other (n, %)	10 (14.1)	13 (10.1)	0.49
Child stage			
B (n, %)	58 (81.7)	108 (83.7)	0.71
C (n, %)	8 (11.3)	11 (8.5)	0.62
MELD	13 ± 4	13 ± 4	0.55
FIPS	-0.18 ± 0.86	-0.10 ± 0.71	0.46
Indication for TIPS †			
Refractory Ascites (n, %)	58 (81.7)	116 (89.9)	0.12
Variceal bleeding (n, %)	20 (28.2)	20 (15.5)	*0.032*
Other (n, %)	7 (9.9)	7 (5.4)	0.26
Sodium (µM/L)	134 ± 5	135 ± 5	0.17
Creatinine (µM/L)	116 ± 58	132 ± 83	0.15
Bilirubin (µM/L)	21 ± 15	20 ± 16	0.49
White blood cells (10^3/µL)	5.95 ± 2.8	6.3 ± 3.7	0.45
Platelet count ((10^3/µL)	128 ± 68	138 ± 79	0.39
E/A (N<1)	28 (43.8)	56 (50.9)	0.36
E/A (N>1.5)	9 (14.1)	13 (11.8)	0.67
PO2 (mmHg)	76.9 ± 11.9	85.9 ± 16.7	*<0.001*
PCO2 (mmHg)	32.5 ± 5.5	33.4 ± 5.0	0.30
AaPO2 (mmHg)	32.2 ± 11.7	22.1 ± 17.4	*<0.001*

† some patients have combined TIPS indication

Conclusion

- Presence of IPVD or HPS increases the risk of hepatic and cardiac decompensation but does not impact overall mortality after TIPS implantation.
- TIPS implantation was not associated with an impaired survival in patients with IPVD and ascites

Figure 2: Multivariable competing risk analyses: *IPVD vs. No IPVD* outcome after TIPS-Insertion **(Analysis 1)**

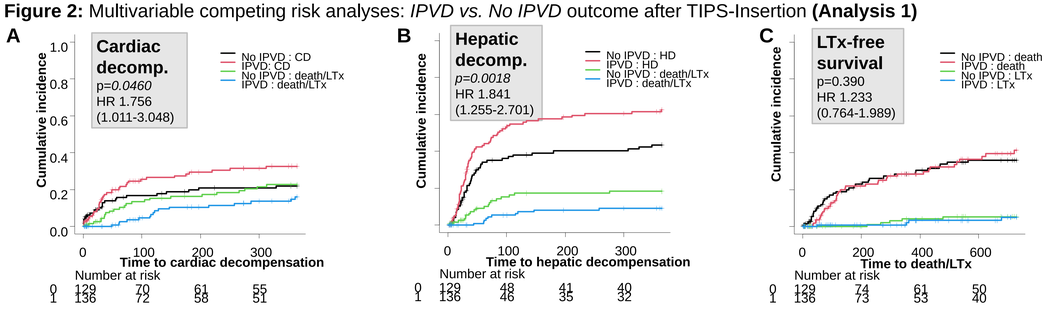


Figure 3: Multivariable competing risk analyses: *HPS vs. No HPS* outcome after TIPS-Insertion **(Analysis 2)**

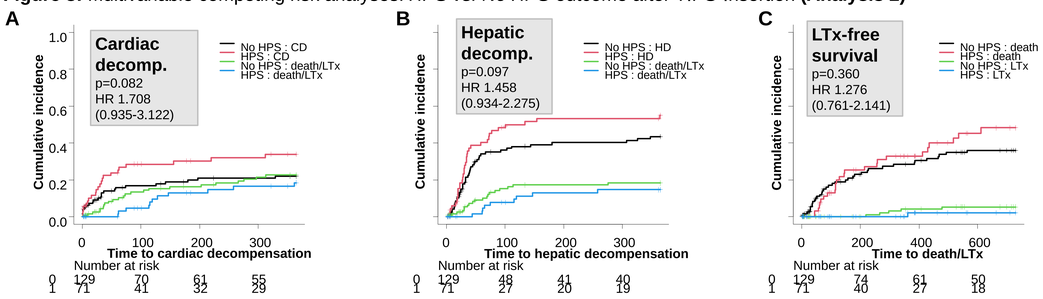
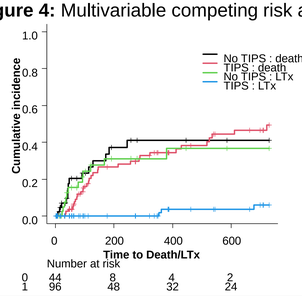


Figure 4: Multivariable competing risk analysis: *TIPS IPVD vs. No TIPS IPVD* – LTx-free survival **(Analysis 3)**



LTx-free survival	HR	95.0% CI for HR		p-value
TIPS	0.766	0.287	2.049	0.600
FIPS	1.611	1.080	2.405	*0.019*
INR	0.280	0.066	1.191	0.085
White blood cells	0.938	0.832	1.058	0.300
ALT	0.985	0.970	1.000	*0.048*

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