Outcomes and Patency of TIPS for Portal Vein Thrombosis from the ALTA Study Group

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ALTA

Advancing Liver Therapeutic Approaches

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Disclosures/Conflicts of Interest

- W.L. Gore and Associates: Grant/research support, consultant
- Echosens – Consultant
- Novo Nordisk – Speaker and Teaching

Background

- Portal vein thrombosis (PVT) is a heterogenous disorder that can occur in patients with and without cirrhosis.
- Fully occlusive acute PVT and chronic PVT with cavernous transformation can result in significant portal hypertensive complications such as variceal bleeding +/- ascites
- PVT can pose a challenge for portal anastomosis for future liver transplantation

Background

- PVT historically has been a contraindication to TIPS given inability to access the portal vein
- Intravascular ultrasound (ICE) and trans-splenic cannulation approaches along with mechanical thrombectomy now permit TIPS placement
- Published data however is limited to small, single center series with low rates of patients with cavernous transformation of the portal vein

Thornburg, B. et al (2016). *Techniques in vascular and interventional radiology*, *19*(1), 52-60.
Rodrigues, S.G. et al (2019). *Alimentary pharmacology & therapeutics*, *49*(1), 20-30.

Background

- Reports of one year patency rates of TIPS in PVT are highly variable (64-92%) with significant heterogeneity
- Inclusion of patients with cavernous transformation range from 0-52%
- Risk factors for post-TIPS thrombosis in PVT are poorly understood

Zhang, J.B. et al (2021). *World Journal of Clinical Cases*, *9*(19), 5179.

Study Objectives

- Quantify long-term patency of TIPS for PVT
- Identify risk factors associated with TIPS stenosis/occlusion in PVT among cirrhotic and non-cirrhotic recipients

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Methods

- Advancing Liver Therapeutic Approaches in Portal Hypertension (ALTA) Study

- Multi-center prospective cohort study across 13 U.S. centers of adults (≥18 years) who were scheduled for TIPS between 7/2019-1/2025 and completed up to 5 years of follow-up

- End of study: liver transplant, death, or other (ex. TIPS permanently occluded, withdrawal of consent)

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The ALTA Consortium Study Group in the use TIPS for the Management of Portal Hypertension

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Methods

- Patients undergoing TIPS with PVT were included for analysis
  - 852 Total TIPS recipients; 150 TIPS with PVT
- TIPS procedure reports were reviewed. Extent and chronicity of PVT was characterized
- Need for future TIPS revision was included
- Patency of TIPS was determined by most recent imaging (US, CT w/ contrast, direct TIPS check)

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Results – Patient Characteristics

	Non-cirrhotic N=54	Cirrhotic N=96
Cirrhosis Etiology		
-Alcohol	-	35 (37%)
-MASLD	-	30 (31%)
-Other (HCV/HBV/Immune)	-	31 (32%)
Hypercoagulable State	20 (37%)	8 (8.4%)
JAK2 mutation	6 (11%)	2 (2%)
Anticoagulation Use (Pre-TIPS)	34 (63%)	15 (16%)
MELD	10 (SD 4.5)	13 (SD 3.9)
MELD-3.0	11.1 (SD 4.9)	15 (SD 5)

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Results – Extent of Mesenteric Thrombosis

	Non-cirrhotic N=54	Cirrhotic N=96	P-value
PVT Type			
-Acute Partially Occlusive	7 (13%)	12 (12.6%)	0.07
-Acute Entirely Occlusive	3 (5%)	3 (3%)	
-Chronic Partially Occlusive	9 (17%)	34 (36%)	
-Cavernous Transformation	35 (65%)	46 (48%)	
Mesenteric Veins Involved			
-Portal only	27 (50%)	60 (63%)	0.23
-Portal and SMV	14 (26%)	22 (23%)	
-Portal and Splenic	8 (15%)	5 (5%)	
-Portal, Splenic and SMV	5 (9%)	8 (8%)	
-SMV	-	1 (1%)	

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Results – TIPS Procedure

	Non-cirrhotic N=54	Cirrhotic N=96	P-value
Extent of Stenting			
-Portal Only	**37 (69%)**	**82 (85%)**	**0.04**
-Portal and SMV	8 (15%)	9 (9%)	
-Portal and Splenic	8 (15%)	4 (4%)	
-Portal, SMV and Splenic	1 (1%)	1 (1%)	
TIPS extended through entire PV	**19 (35%)**	**16 (17%)**	**0.016**
Intravascular Ultrasound (ICE)	32 (72%)	73 (76%)	0.697
Procedural Complications			
Bleeding	1 (2%)	6 (6%)	0.422
AKI	1 (2%)	3 (3%)	1.0
Death	0	0	1.0

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Death	0	0	1.0

Results – Post TIPS Outcomes

	Non-cirrhotic N=54	Cirrhotic N=96	P-value
Hospitalization for HE	7 (13%)	25 (26%)	0.065
Any TIPS Revision	**34 (63%)**	**32 (33%)**	**0.001**
# of Revisions for Stenosis/Occlusion			
1	**15 (28%)**	**17 (18%)**	**0.012**
2	**8 (15%)**	**4 (4%)**	
3	**0 (0%)**	**1 (1%)**	
5	**1 (2%)**	**0 (0%)**	
TIPS Permanently Occluded	2 (4%)	1 (1.0%)	0.542
Partial TIPS Occlusion	6 (11%)	13 (14%)	
No Occlusion	46 (85%)	82 (85%)	

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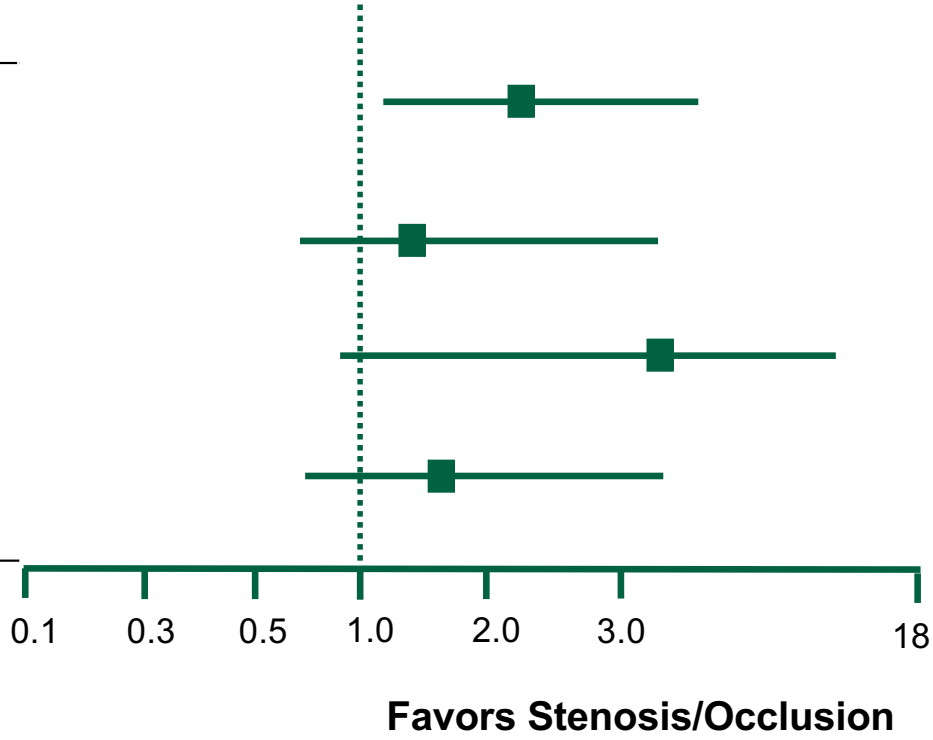
No Occlusion	46 (85%)	82 (85%)	

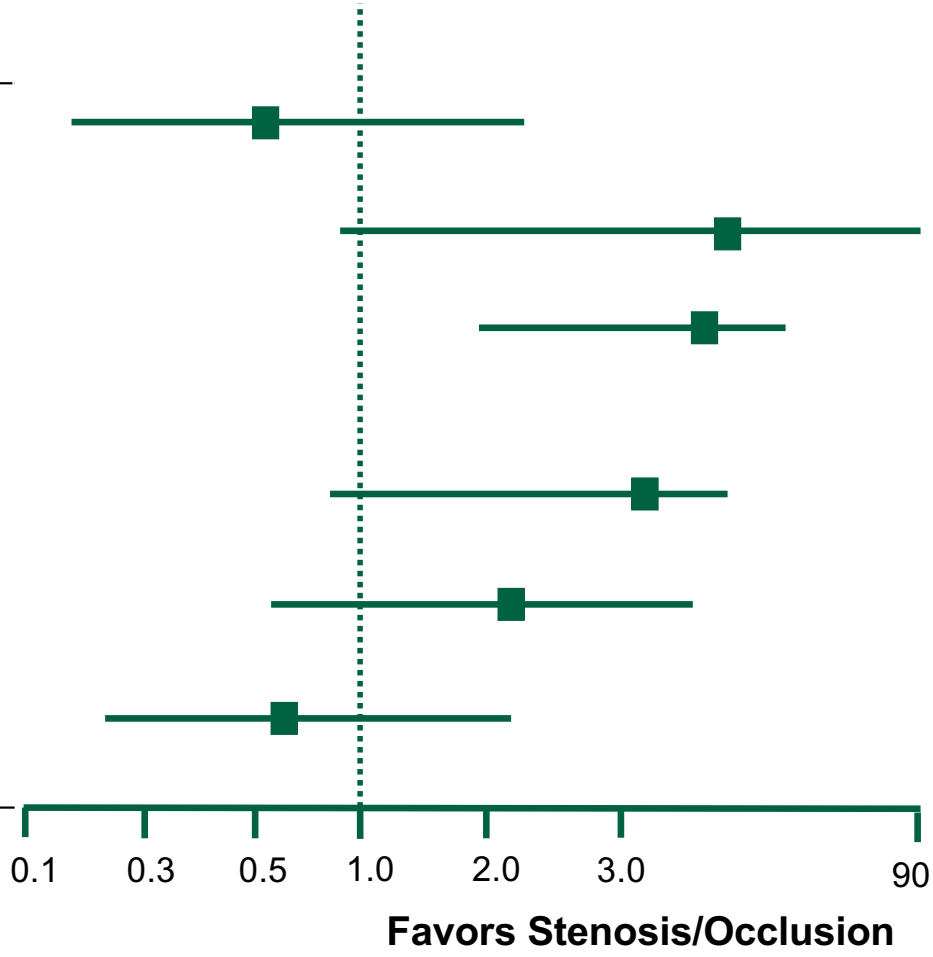
Results – Risk for TIPS Revision for Stenosis/Occlusion

	Odds Ratio	95% CI
Non-cirrhotic vs Cirrhotic	**2.23**	**1.03-5.07**
Hypercoagulable state	1.36	0.53-3.49
Chronic vs Acute PVT	3.46	0.93-12.80
Portal + (SMV or SV thrombosis)	1.74	0.79-3.84

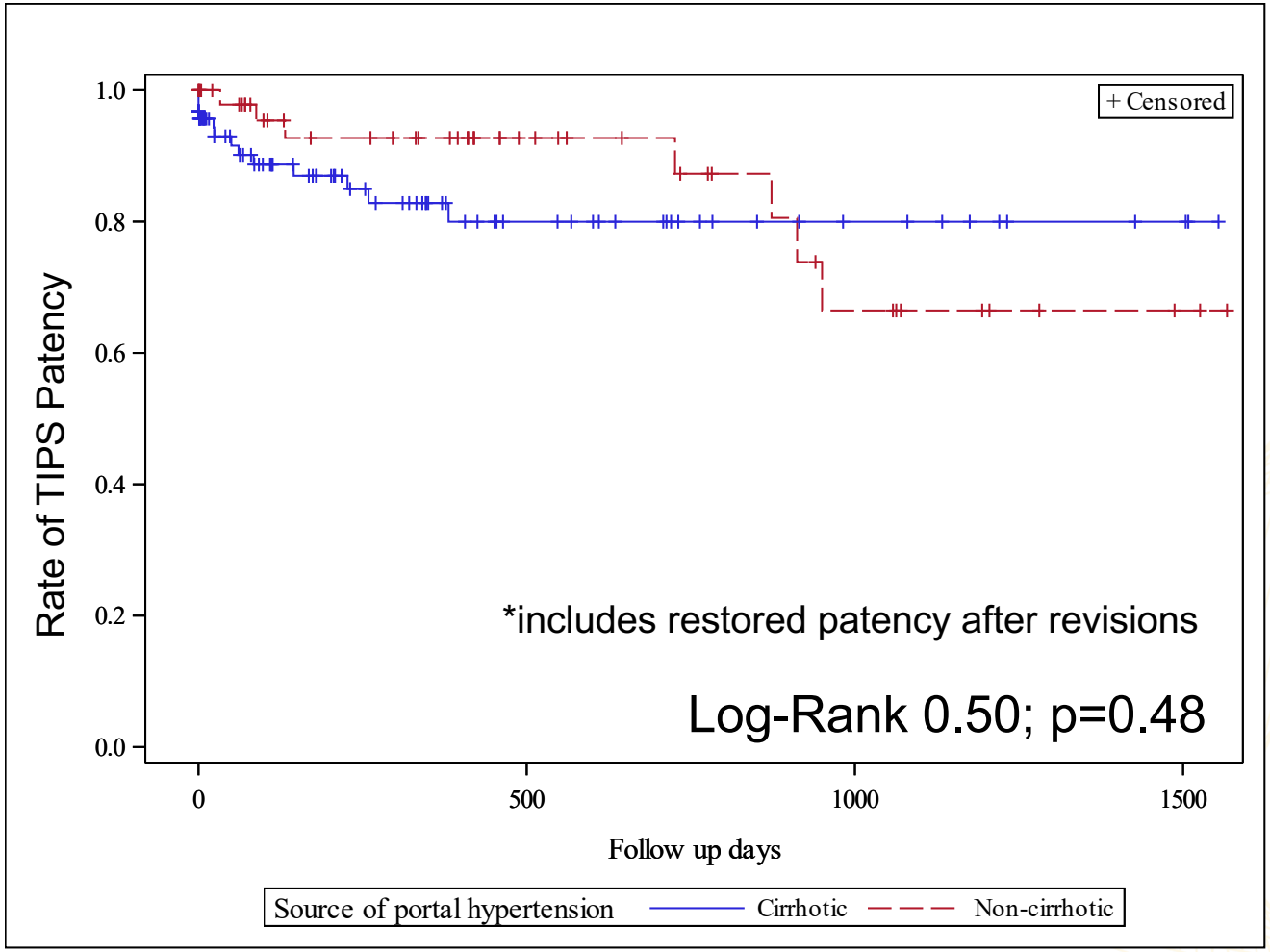


Results – Risk for TIPS Revision for Stenosis/Occlusion

	Odds Ratio	95% CI
Non-cirrhotic:		
Hypercoagulable state	0.66	0.17-2.51
Chronic vs Acute PVT	8.12	0.82-80.5
Portal + (SMV or SV thrombosis)	**6.84**	**1.80-26**
Cirrhotic:		
Hypercoagulable state	3.68	0.80-17
Chronic vs Acute PVT	2.20	0.44-11
Portal + (SMV or SV thrombosis)	0.66	0.21-2.1



Overall* TIPS Patency – Cirrhotic vs Non-cirrhotic



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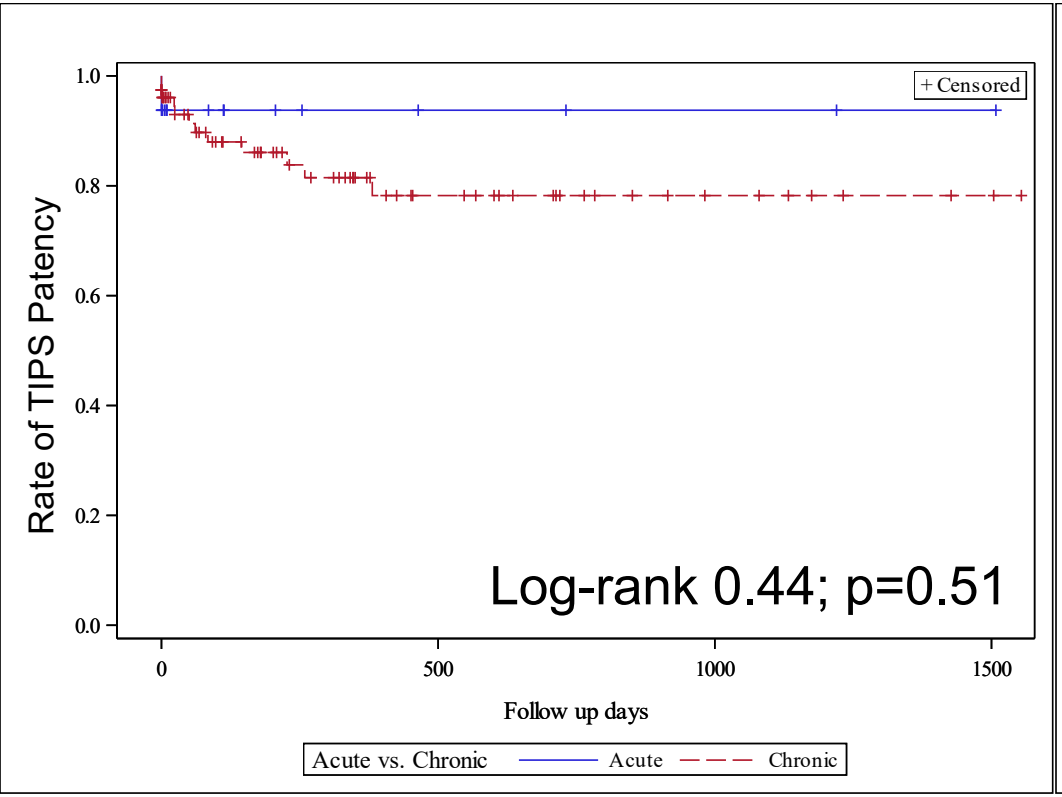
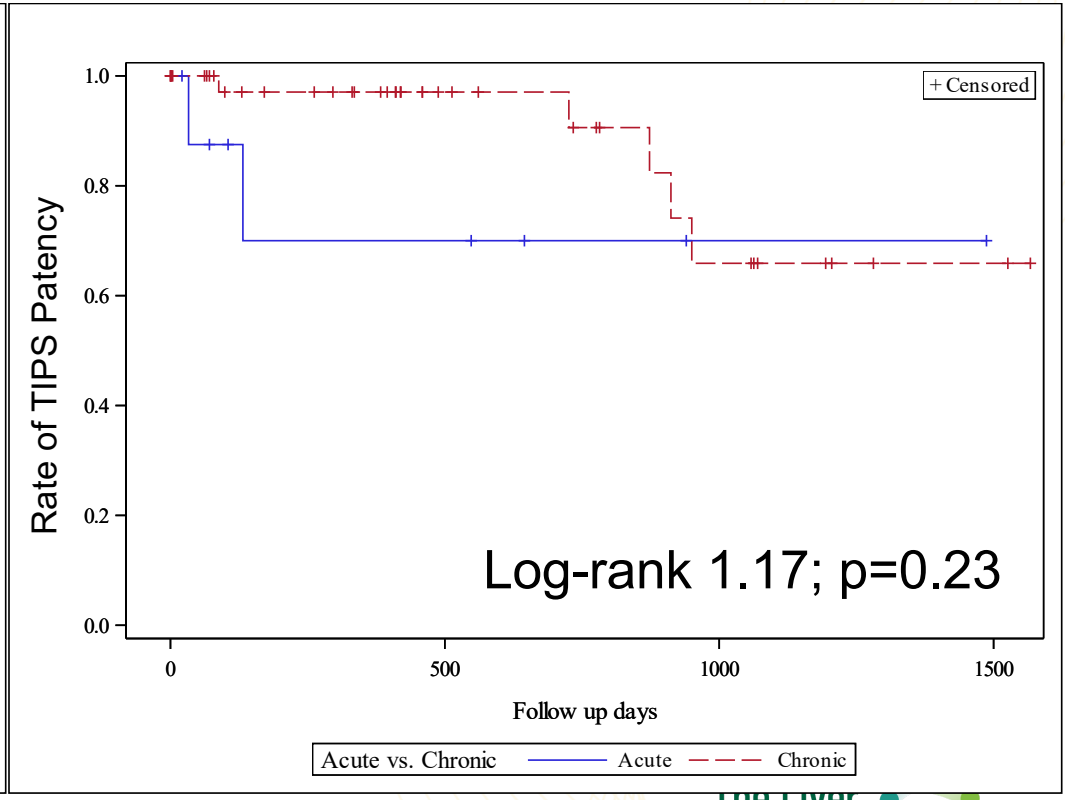
Overall* TIPS Patency – Acute vs Chronic PVT

Cirrhotic



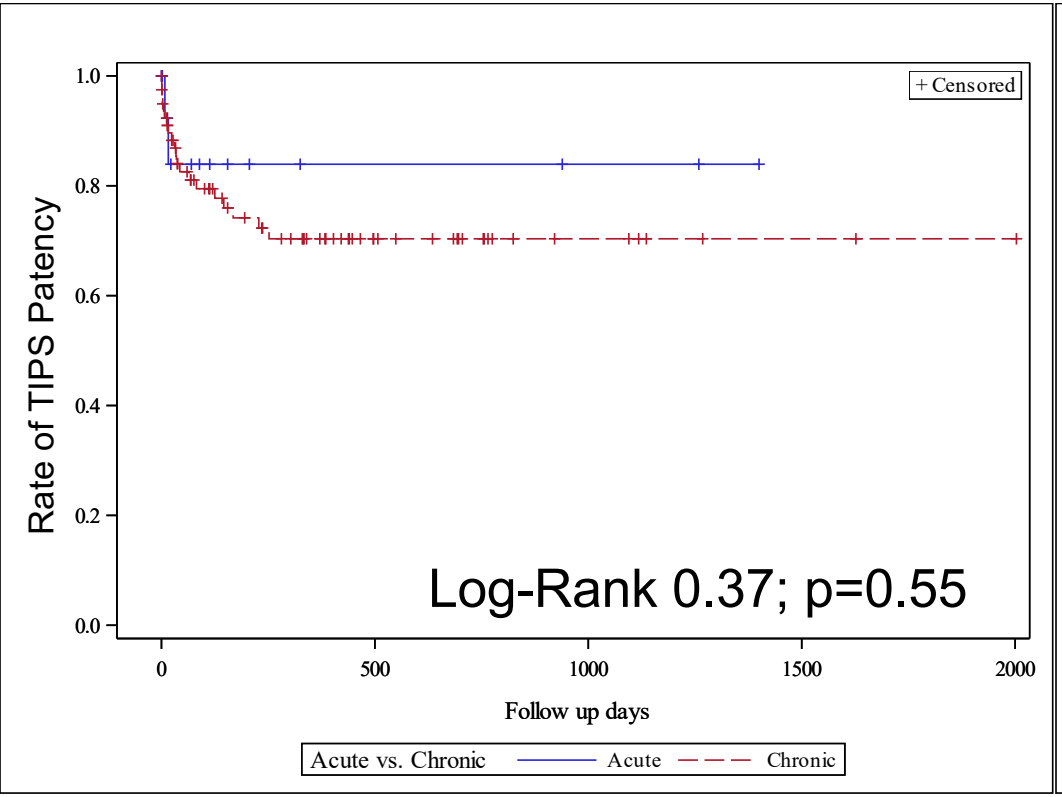
Non-Cirrhotic



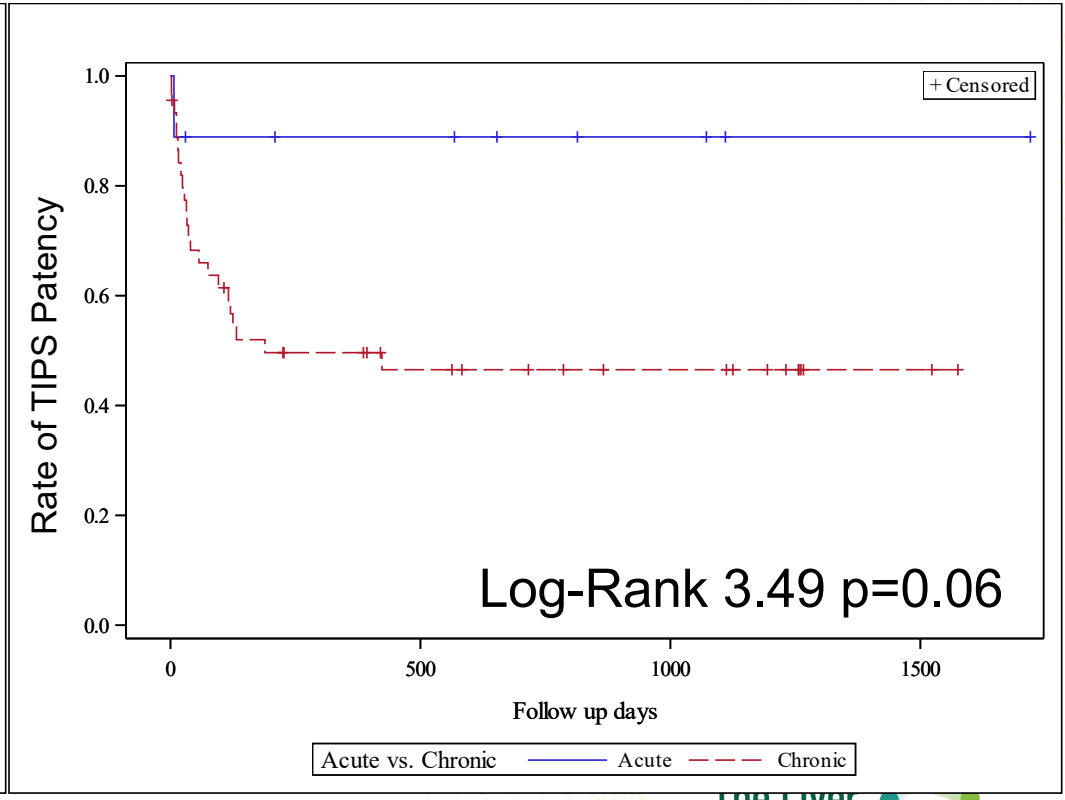
*includes restored patency after revisions

Time to First TIPS Revision for Stenosis/Occlusion: Acute vs Chronic PVT

Cirrhotic



Non-Cirrhotic



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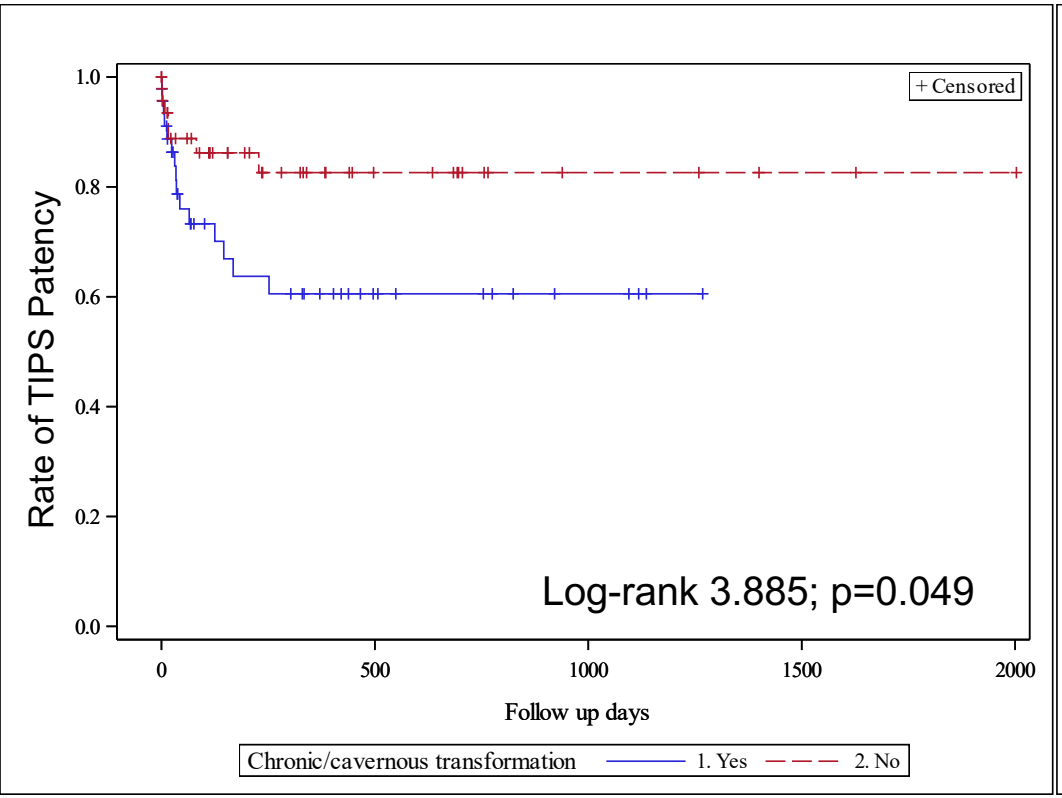
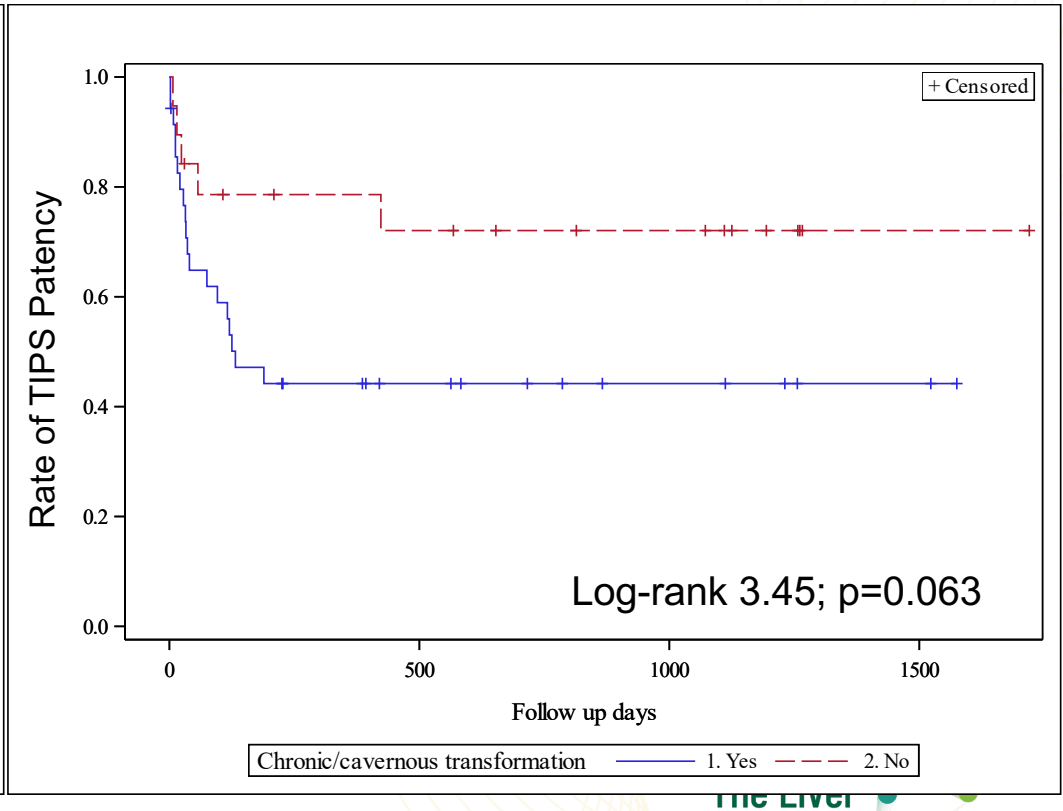
Time to First TIPS Revision: Cavernous Transformation vs other PVT

Cirrhotic

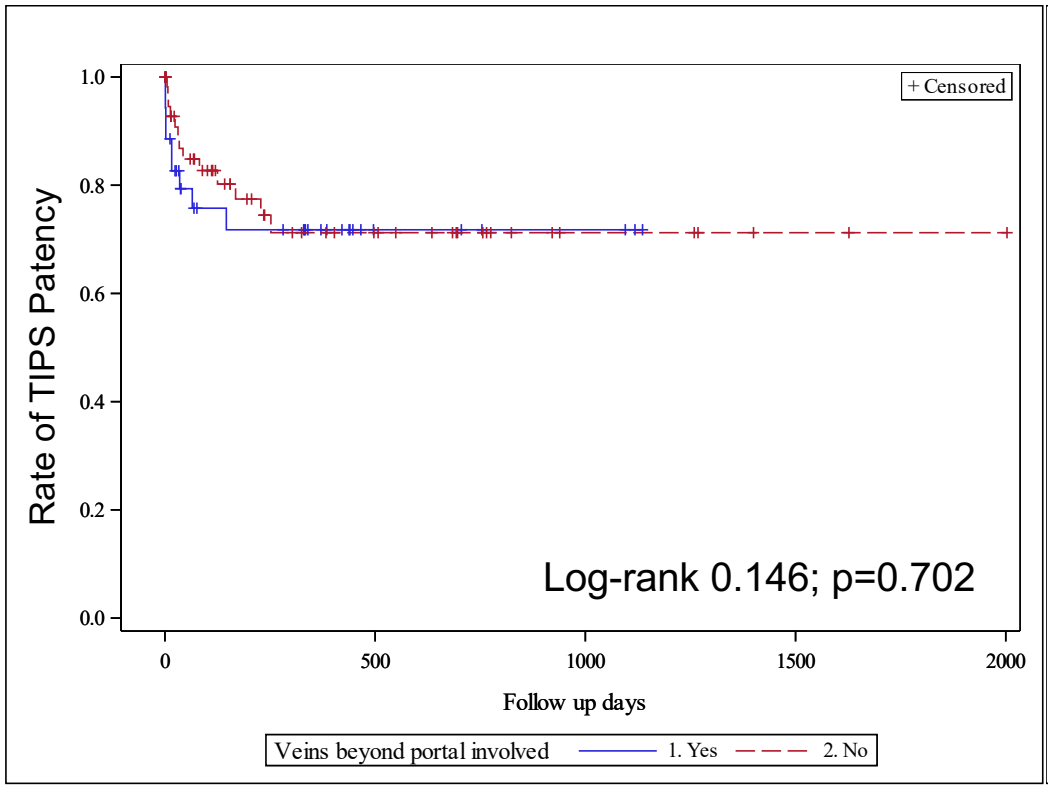


Non-Cirrhotic

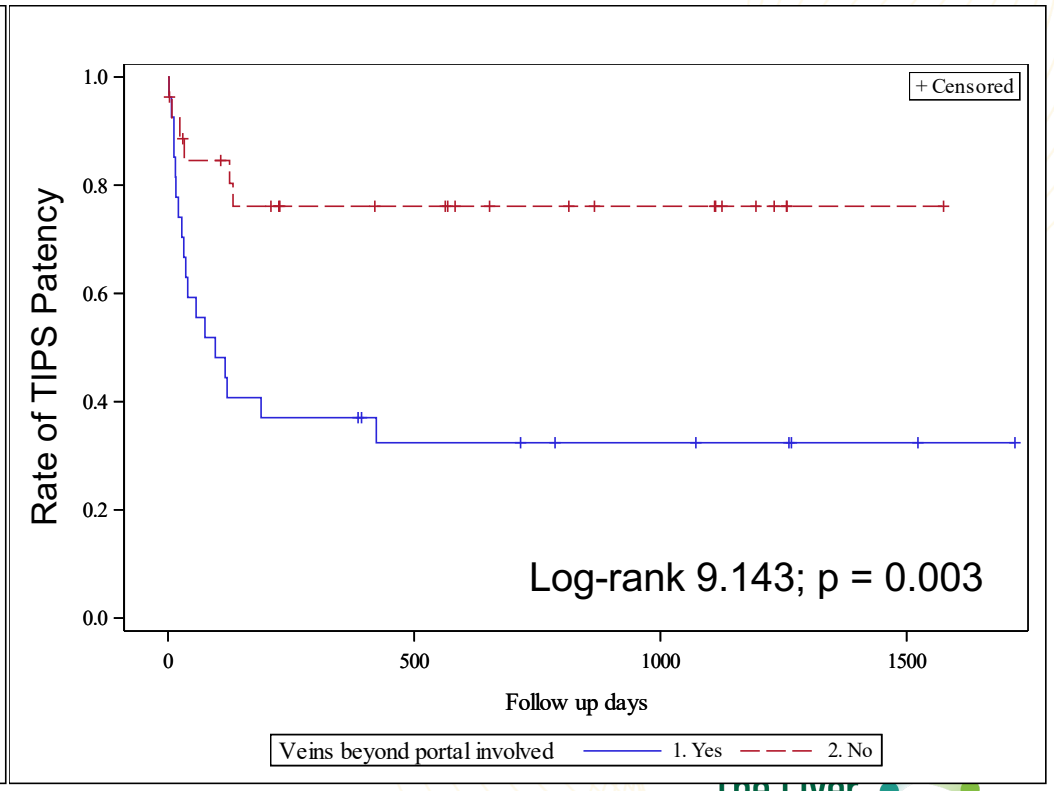


Time to First Revision for Occlusion: PV + Mesenteric Veins vs Portal PVT only

Cirrhotic



Non-Cirrhotic



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Conclusions

- TIPS in non-cirrhotic PVT is more likely require TIPS revisions (63%) for stenosis/occlusion
- Overall patency of TIPS in PVT after revisions is similar for cirrhotic and non-cirrhotic recipients
- A hypercoagulable state was not associated with higher rates of TIPS stenosis/occlusion
- Attention on follow up is warranted in TIPS recipients with prior cavernous transformation of the portal vein as well as thrombosis involvement of other mesenteric veins

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Thank you

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