



# TIPS insertion leads to partial reversal of systemic inflammation in patients with decompensated liver cirrhosis

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## Background & Aims

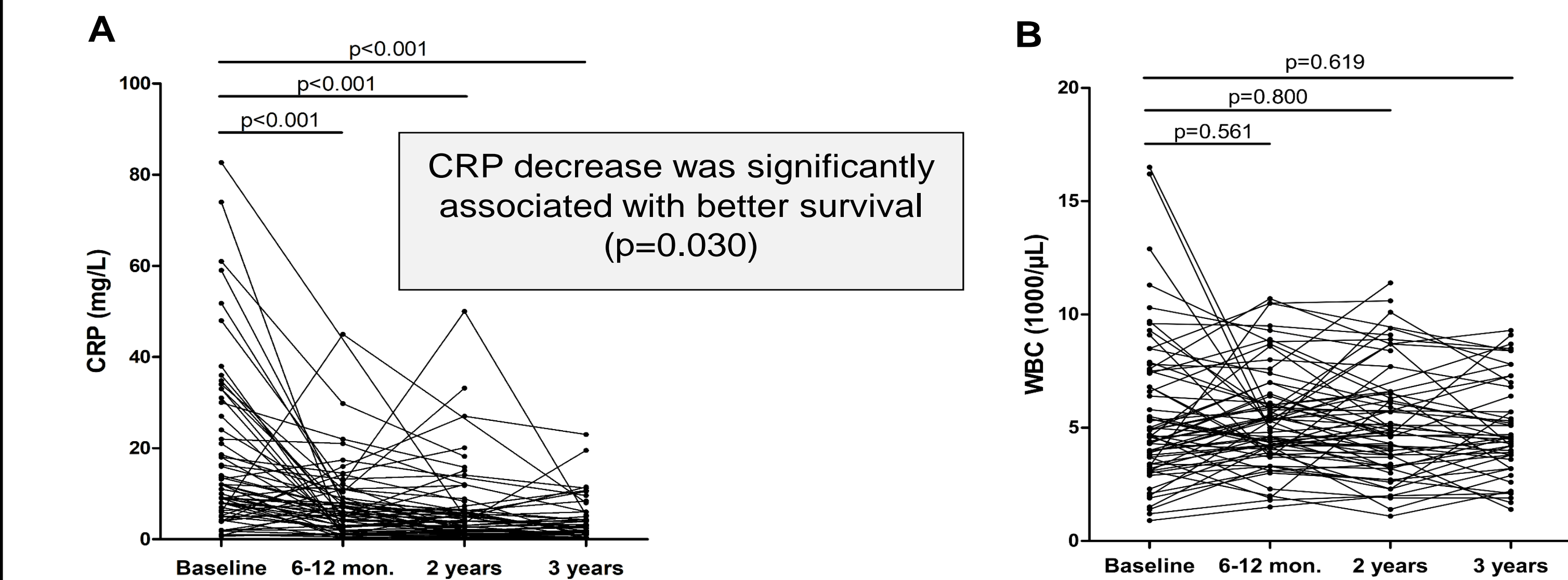
- Patients with decompensated liver cirrhosis are characterized by a state of systemic inflammation (SI), which is closely linked to several complications, e.g. sarcopenia.
- Portal hypertension is considered to play a central role in this process.
- Transjugular intrahepatic portosystemic shunt (TIPS) implantation is an effective treatment option for portal hypertension.
- The aim of this study was to investigate the impact of TIPS insertion on SI in patients with liver cirrhosis.

## Patients and Methods

- In this cross-sectional study a number of 177 consecutive cirrhotic patients receiving a TIPS at Hannover Medical School were included.
- C-reactive protein (CRP) and white blood cells (WBC) were compared between baseline and 6-12, 24 and 36 months after TIPS.
- In a subset of 59 patients we were able to perform a more detailed analysis of the inflammation status measuring 48 different cytokines.
- The respective plasma samples were prospectively collected from the cubital vein at baseline as well as 1, 3 and 6 months after TIPS.
- Blood samples from 5 healthy individuals served as control.
- Changes of cytokine levels were correlated with the physical status as indicated by body mass index (BMI), hand grip strength (HGS) and mid-arm muscle circumference (MAMC).

## Results

**Figure 1:** Course of (A) CRP levels and (B) white blood cells (WBC) in the long-term follow-up after TIPS insertion.



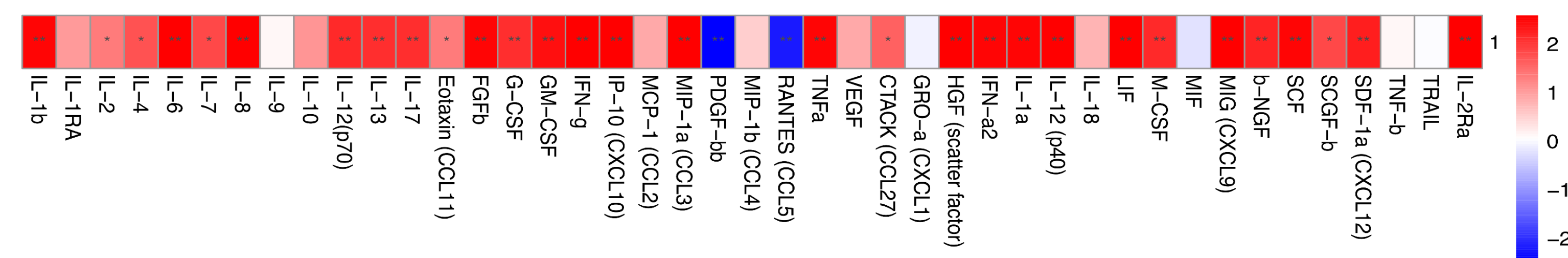
## Results

**Table 1:** Baseline characteristics of TIPS patients.

	All patients	Subset for cytokine analysis
Patients (n, %)	177 (100)	59 (33)
Age (y)	56 (49-63)	57 (50-65)
Male/female (n, %)	108 (61)/ 69 (39)	34 (58)/ 25 (42)
TIPS indication†		
Refractory ascites (n, %)	134 (76)	46 (78)
Bleeding (n, %)	50 (28)	13 (22)
Hepatic hydrothorax (n, %)	2 (1)	0 (0)
MELD	12 (10-15)	11 (9-14)
FIPS	-0.22 (-0.85-0.14)	-0.20 (-0.63-0.05)
Child Pugh		
Class A (n, %)	26 (15)	13 (22)
Class B (n, %)	134 (75)	42 (71)
Class C (n, %)	17 (10)	4 (7)
PSG before TIPS (mmHg)	16.0 (13.1-19.0)	15.0 (13.0-17.5)
PSG after TIPS (mmHg)	5.2 (4.0-7.4)	5.0 (4.0-8.0)
% reduction of PSG	65 (56-73)	67 (52-71)
CHE (kU/L)	2.52 (1.82-3.82)	2.36 (1.69-3.77)
Bilirubin (μmol/L)	18 (11-28)	16 (9-27)
Creatinine (μmol/L)	97 (75-130)	97 (80-130)
INR	1.26 (1.13-1.41)	1.15 (1.06-1.31)
Sodium (mmol/L)	136 (132-139)	136 (131-137)
Platelets (10 <sup>3</sup> /μL)	105 (72-171)	115 (67-212)
White blood cells (10 <sup>3</sup> /μL)	5.0 (3.7-7.7)	5.1 (3.5-7.5)
CRP (mg/L)	9.2 (4.0-21.9)	11.3 (3.4-22.0)
Albumin (g/L)	29 (26-35)	30 (27-36)
Haemoglobin (g/dL)	9.7 (8.7-11.6)	9.6 (8.7-11.1)

† some patients have mixed TIPS indication. Therefore, the summation of percentages results in >100%.

**Figure 2:** Cytokine levels of cirrhotic patients at baseline compared to those of healthy controls.

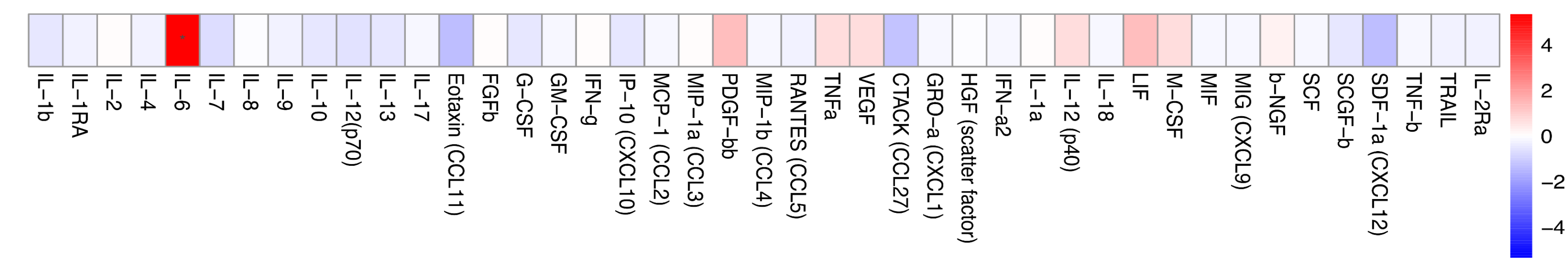


- Red color = higher concentration of the respective cytokine
- Blue color = lower concentration of the respective cytokine
- Asterisks indicate significant results:  
\* = False discovery rate (FDR) <0.05; \*\* = FDR <0.01

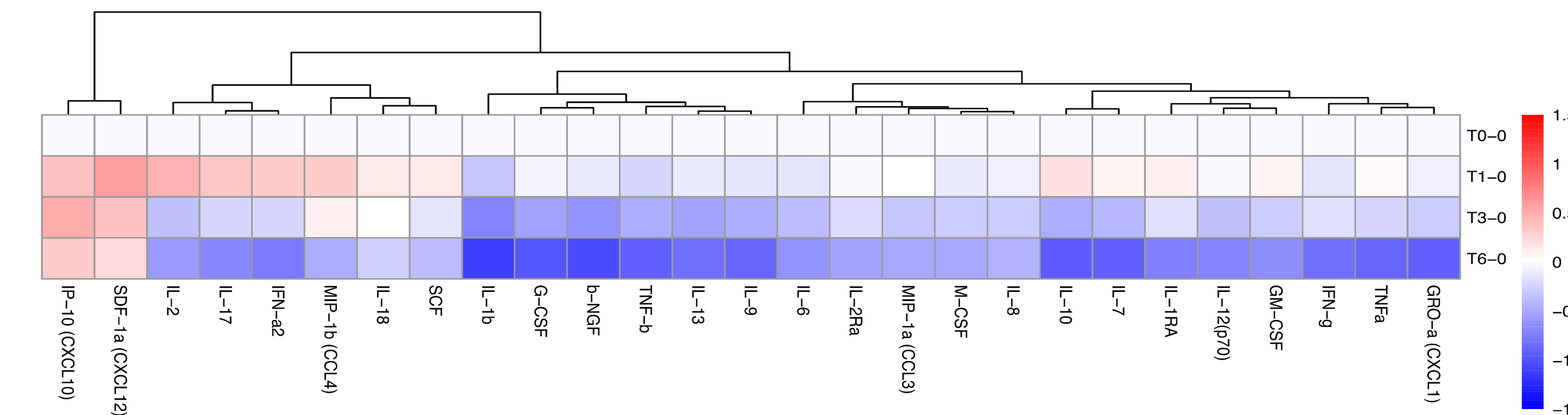
## Conclusion

- Decreasing portal hypertension via TIPS insertion leads to a significant improvement of SI over time, which is associated with a favorable clinical outcome.

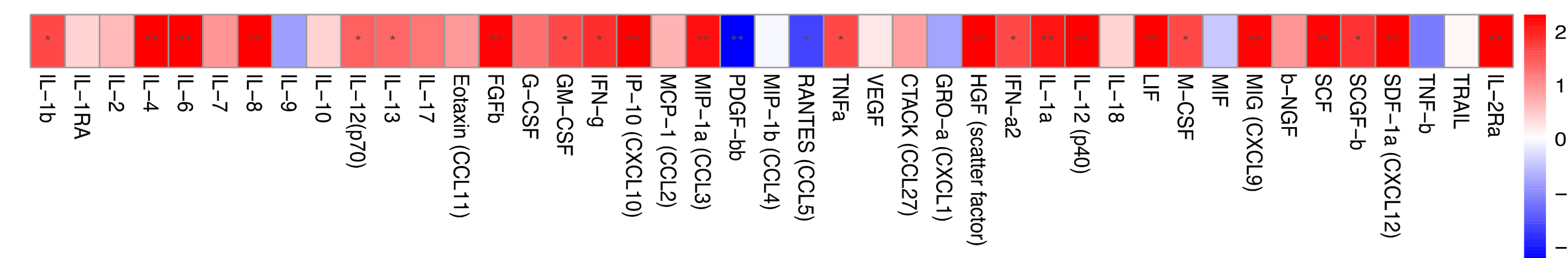
**Figure 3:** Comparison of SI between patients with refractory ascites (RA) and variceal bleeding.



**Figure 4:** Course of SI from baseline to 6 months after TIPS insertion.



**Figure 5:** Comparison of cytokine levels of cirrhotic patients 6 months after TIPS compared to those of healthy controls.



➤ IL-2, IL-7, IL-17, Eotaxin, G-CSF, CTACK, b-NGF do not show any statistical difference anymore at 6 months after TIPS insertion.

When correlating cytokine changes with the clinical status, IL-6 appeared to be of particular interest:

- A decrease in IL-6 was associated with a significant improvement in MAMC and numerical increase in HGS and BMI.