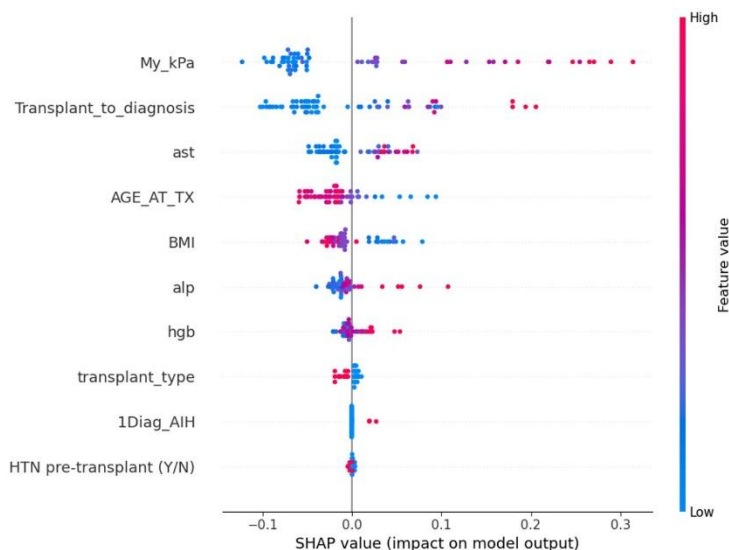
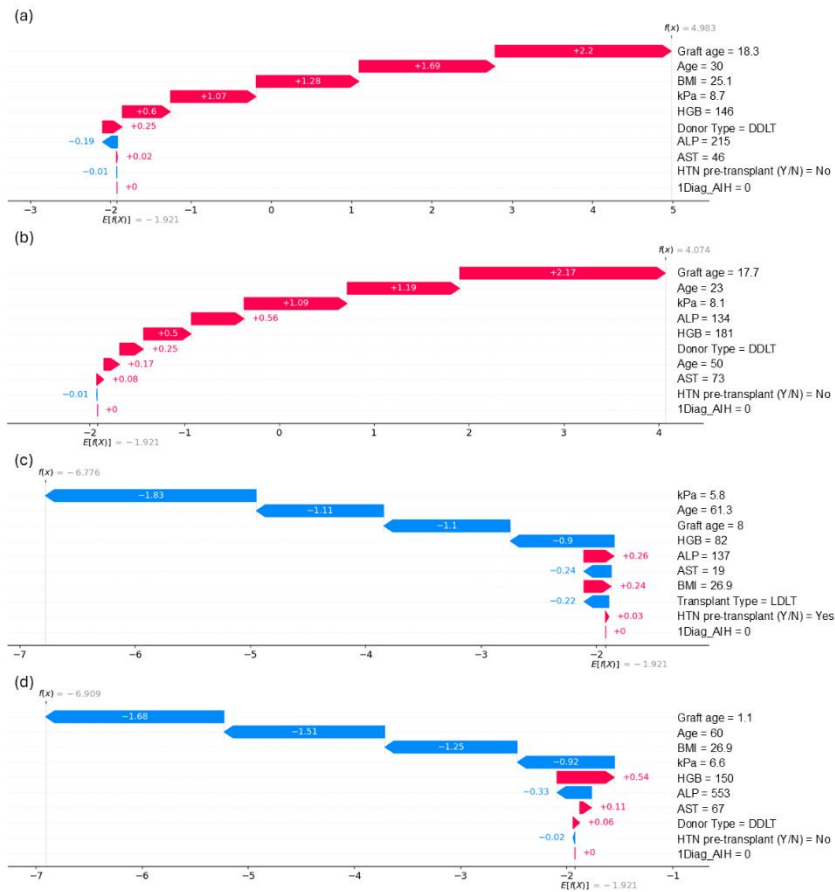


**Supplementary Figure 1 Median liver stiffness (kPa) by BMI category.** While median liver stiffness tends to increase with higher BMI, the large SDs (see Supplementary Table 1) limit interpretability. No clear conclusion can be drawn regarding the association between BMI and liver stiffness in patients with significant fibrosis (stage  $\geq 2$ ) or no fibrosis (stage  $< 2$ ), potentially due to small sample sizes within each subgroup. Refer to Supplementary Table 1 for detailed values.



**Supplementary Figure 2 Bees worm Plot of the shapely valued for the XGBoost classifier.**



**Supplementary Supplementary Figure 3 Contributing factors in XGBoost decision-making for 4 patients by Shapley additive explanation analysis.** In this visual representation, features highlighted in red signify a favorable influence on graft fibrosis, although those depicted in blue are linked to a detrimental effect on graft fibrosis. (a) and (b) patients with a significant fibrosis, (c) and (d) patients without fibrosis. The red arrow box represents a positive effect in fibrosis diagnosis, and a blue arrow represents a negative effect. BMI, body mass index; HGB, hemoglobin; ALP, Alkaline Phosphatase; AST, Aspartate Aminotransferase; HTN, hypertension; Diagnosis of Autoimmune Hepatitis.

**Supplementary Table 1 Impact of BMI on liver stiffness measurements. "nan" indicate that the corresponding measurement could not be defined due to an insufficient number of samples within that specific BMI range**

BMI range	Number of samples				Liver stiffness measurement (kPa) (median $\pm$ SD)			
	Graft	fibrosis	Graft	fibrosis	Graft	fibrosis	Graft	fibrosis
	stage < 2		stage $\geq$ 2		stage < 2		stage $\geq$ 2	
< 18.5	1		2		6.0 $\pm$ nan		7.35 $\pm$ 0.6	
$\geq$ 18.5 & < 25	37		7		5.3 $\pm$ 3.9		12.1 $\pm$ 3.5	
$\geq$ 25 & < 30	75		18		5.8 $\pm$ 6.5		11.8 $\pm$ 9.7	

**Supplementary Table 2 Model hyper parametrization**

Model	Parameters tried	Selected
Logistic regression	C: [0.01, 0.1, 1, 10],	0.1
	penalty: [l1, l2]	l1
Support vector machine	C: [0.1, 1, 10],	0.1
	kernel: [linear, rbf]	rbf
Random Forest	n_estimators:[50,100,200]	200
	max_depth:[2,4,8,16,32],	8
	min_samples_split:[2,5,10,20]	10
XGBoost	n_estimators:[50,100,200]	200
	learning_rate: [0.01, 0.1, 0.2]	0.1
	max_depth:[3,6,10]	3