

SUPPLEMENTARY MATERIAL

Supplementary table 1. Model performance and internal validation

Model	n	Events	Covariates	EPV	C-statistic (95% CI)	Optimism-corrected C	Calibration slope
Steatosis (CAP ≥ 288 dB/m)	1033	424	6	70.7	0.739 (0.709–0.769)	0.732	0.96
Clinically significant fibrosis (LSM ≥ 8 kPa)	1029	100	6	16.7	0.862 (0.823–0.901)	0.855	0.96
At-risk MASH (FAST–HbA1c)	1050	52	3	17.3	0.941 (0.912–0.971)	0.939	0.97

EPV, events per variable. C-statistic shown as the apparent value with 95% confidence interval (DeLong). Internal validation was performed using 1,000 bootstrap resamples; the optimism-corrected C-statistic and calibration slope are reported (Harrell).

Models were fitted using complete-case analysis

Supplementary Table 2. Characteristics of patients with and without lean MASLD.

	Lean MASLD (n=59)	MASLD (n=495)	p value
Sex (Female)	40 (67.8)	305 (61.7)	0.364
Age (years)	57 (51-63)	54 (48-61)	0.063
BMI (kg/m ²)	23.8 (22.7-24.4)	30.8 (28.0-33.7)	<0.001
<i>Transient elastography</i>			
kPa	5 (4.0-6.2)	5.2 (4.3-6.6)	0.391
CAP (dB/m)	319 (302-335)	325 (305-348)	0.066
FAST score	0.14 (0.05-0.24)	0.15 (0.06-0.30)	0.531
<i>Biochemical parameters</i>			
Total cholesterol mg/dL	170 (151-215)	168 (139-197)	0.080
LDL mg/dL	100 (82-129)	100 (76-122)	0.315
HDL mg/dL	42 (36-51)	40 (36-47)	0.427
TGC mg/dL	163 (123-234)	157 (117-224)	0.636
Creatinine mg/dL	0.75 (0.60-0.91)	0.73 (0.64-0.89)	0.915

ALT U/L	26.5 (15.8-36.6)	28.6 (20.1-42.7)	0.110
AST U/L	22.8 (17.4-27.4)	22.2 (17.6-29.3)	0.686
GGT U/L	31 (17.9-40.1)	31.9 (22.7-49.2)	0.226
HbA1c %	6.8 (6.1-8.5)	7.0 (6.1-8.7)	0.901

BMI, body mass index; FAST score, LDL, low density cholesterol; HDL, high density cholesterol; TGC, triglycerides; ALT, alanine aminotransferase; AST, aspartate aminotransferase; GGT, gamma-glutamyl transferase; HbA1c, glycated hemoglobin.

The results are expressed as median (p25-p75) and n (%)

Supplementary Table 3. Characteristics of the study population according to control of type 2 diabetes mellitus according to glycated hemoglobin values.

	HbA1c% ≤6.4 (n=471)	HbA1c% 6.5-7.0 (n=178)	HbA1c% 7.1-8.9 (n=269)	HbA1c % ≥9.0 (n=239)	p value
Sex (Female)	310 (65.8)	110 (61.8)	153 (56.9)	118 (49.4)	<0.001
Age (years)	56 (49-63)	56 (50-63)	56 (50 – 64)	53 (46 – 60)	<0.001
BMI (kg/m²)	28.4 (25.6-31.6)	27.8 (24.9-31.2)	28.3 (25.4-31.2)	28.4 (25.5-31.6)	0.497
BMI Classification					
Normal	93 (20.5)	42 (25.5)	52 (20.6)	50 (22.0)	0.587
Overweight	185 (40.8)	67 (40.6)	104 (41.1)	88 (38.8)	
Obesity class I	127 (28.0)	42 (25.5)	68 (26.9)	62 (27.3)	
Obesity class II	42 (9.3)	9 (5.5)	22 (8.7)	17 (7.5)	
Obesity class III	6 (1.3)	5 (3.0)	7 (2.8)	10 (4.4)	
Transient elastography					

kPa	4.6 (3.7 -5.8)	4.7 (3.6-6.2)	4.8 (4.1-6.2)	4.9 (3.7-6.0)	0.062
CAP (dB/m)	263 (227 – 306)	283 (245-326)	286 (241-325)	278 (234-308)	<0.001
FAST score	0.07 (0.03-0.17)	0.08 (0.04-0.18)	0.09 (0.03-0.19)	0.05 (0.02-0.18)	0.023
Low risk	389 (89.4)	141 (83.9)	219 (86.9)	211 (89.8)	0.114
Moderate risk	40 (9.2)	24 (14.3)	25 (9.9)	16 (6.8)	
High risk	6 (1.4)	3 (1.8)	8 (3.2)	8 (3.4)	
Biochemical parameters					
Total cholesterol mg/dL	163 (138-186)	161 (136-186)	165 (138-198)	178 (140-202)	0.003
LDL mg/dL	98 (75-120)	99 (74-119)	96 (74-122)	104 (75-128)	0.111
HDL mg/dL	44 (38-52)	42 (37-48)	41 (35-50)	40 (34-48)	<0.001
TGC mg/dL	129 (98-176)	131 (97-170)	149 (111-222)	171 (120-238)	<0.001
Creatinine mg/dL	0.76 (0.66-0.89)	0.78 (0.65-0.93)	0.77 (0.66-0.91)	0.73 (0.61-0.86)	0.064
ALT U/L	22.1 (16.1-33.1)	24.7 (18.1-34.4)	25.7 (18.0-36.0)	23.4 (16.9-33.7)	0.018
AST U/L	20.8 (17.2-27.2)	21.0 (17.2-27.5)	20.9 (16.9-26.7)	18.7 (15.0-26.0)	0.003
GGT U/L	22.8 (16.7- 35.0)	26.5 (19.3-38.9)	27.5 (19.8-45.2)	31.3 (21.2-45.8)	<0.001
HbA1c %	5.9 (5.6-6.2)	6.7 (6.6-6.9)	7.8 (7.3-8.3)	10.6 (9.7 – 11.8)	<0.001

BMI, body mass index; FAST score, LDL, low density cholesterol; HDL, high density cholesterol; TGC, triglycerides; ALT, alanine aminotransferase; AST, aspartate aminotransferase; GGT, gamma-glutamyl transferase; HbA1c, glycated hemoglobin.

*1157 patients had HbA1c determined at the time of elastography.

The results are expressed as median (p25-p75) and n (%)

Supplementary Table 4. Sensitivity analysis of clinically significant fibrosis using alternative liver stiffness thresholds: prevalence and multivariable associations

	LSM ≥8 kPa	LSM ≥8.5 kPa	LSM ≥10 kPa
Prevalence, n (%)	131 (9.9)	117 (8.8)	77 (5.8)
Events per variable (EPV)	16.7	14.8	9.7
C-statistic (95% CI)	0.862 (0.823–0.901)	0.874 (0.835–0.913)	0.906 (0.867–0.945)
BMI class	1.71 (1.34–2.18)	1.56 (1.21–2.02)	1.56 (1.14–2.15)
Steatosis by CAP	1.40 (0.83–2.37)	1.67 (0.95–2.93)	1.50 (0.73–3.04)
HbA1c ≥6.5%	1.50 (0.88–2.56)	1.23 (0.70–2.14)	1.16 (0.58–2.31)

Supplementary Table 4. Sensitivity analysis of clinically significant fibrosis using alternative liver stiffness thresholds: prevalence and multivariable associations

	LSM $\geq$ 8 kPa	LSM $\geq$ 8.5 kPa	LSM $\geq$ 10 kPa
High AST	3.69 (2.04–6.69)	3.88 (2.11–7.13)	2.46 (1.20–5.05)
High ALT	1.99 (1.10–3.59)	2.23 (1.17–4.25)	3.59 (1.45–8.88)
GGT (per U/L)	1.02 (1.02–1.03)	1.02 (1.02–1.03)	1.03 (1.02–1.04)

Values are odds ratios (95% confidence interval) from multivariable logistic regression, except if indicated

Supplementary Table 5. Logistic regression to evaluate the risk factors associated with at risk MASH by FAST score

Univariate				
	OR	CI 95%	β	p-value
Age	0.99	0.966-1.016	-0.009	0.479
Obesity	3.08	1.746-5.420	1.124	<0.001
Sex	1.37	0.769-2.447	0.316	0.285
Creatinine	0.18	0.036-0.874	-1.726	0.034
Triglycerides mg/dL	1.001	0.998-1.003	0.001	0.502
HDL cholesterol	0.98	0.955-1.007	-0.020	0.144
LDL cholesterol	0.99	0.990-1.007	-0.002	0.676
ALT (per 10 U/L)	1.72	1.550-1.917	0.544	<0.001
High GGT	10.30	5.739-18.503	2.333	<0.001
Multivariate				
	OR	CI 95%	β	p-value
Obesity	3.03	1.49-6.17	1.108	0.002
ALT (per 10 U/L)	1.66	1.47-1.86	0.504	<0.001
GGT	3.22	1.50-6.90	1.168	0.003

FAST score, LDL, low density cholesterol; HDL, high density cholesterol; ALT, alanine aminotransferase; GGT, gamma-glutamyl transferase.
ALT was modeled as continuous, as the dichotomized term produced near-complete separation, yielding unstable estimates