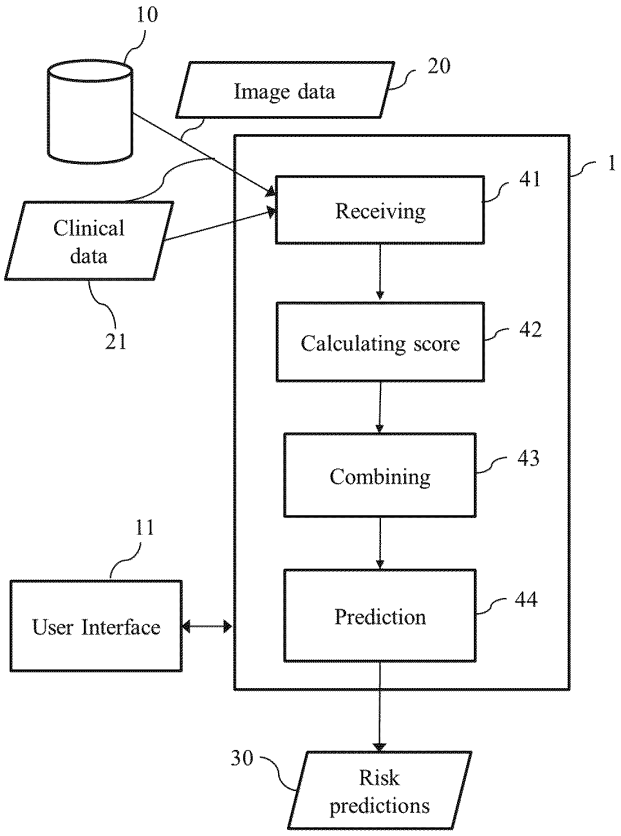

10
Image data
20
1
41
Receiving
Clinical data
21
Calculating score
42
Combining
43
11
User Interface
Prediction
44
30
Risk predictions

FIG. 1

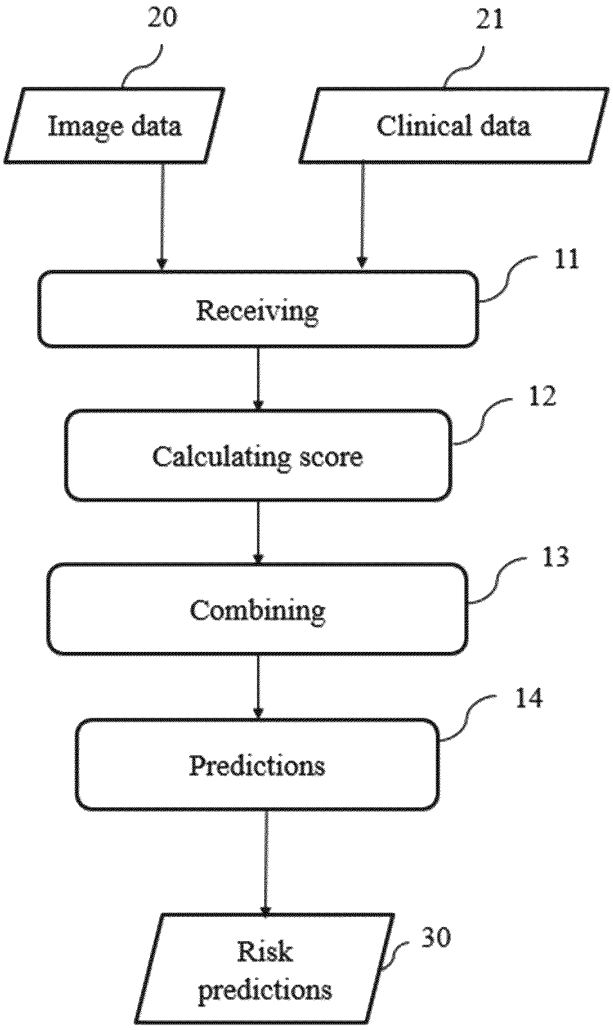

20
21
Image data
Clinical data
11
Receiving
12
Calculating score
13
Combining
14
Predictions
Risk predictions
30

FIG. 2

| | | NAFLD (n=72) | NAFL (n=34) | NASH (n=38) |
|---|---|---|---|---|
| Age (years) | | 57 ± 14 | 54 ± 16 | 60 ± 13 |
| Sex | Female | 25 | 14 | 11 |
| | Male | 47 | 20 | 27 |
| Steatosis score | 1 | 40 | 24 | 16 |
| | 2 | 15 | 7 | 8 |
| | 3 | 17 | 3 | 14 |
| Activity score | 0 | 23 | 26 | 0 |
| | 1 | 8 | 8 | 0 |
| | 2 | 23 | 0 | 23 |
| | 3 | 13 | 0 | 13 |
| | 4 | 2 | 0 | 2 |
| Fibrosis score | 0 | 25 | 25 | 0 |
| | 1 | 15 | 6 | 9 |
| | 2 | 7 | 2 | 5 |
| | 3 | 11 | 0 | 11 |
| | 4 | 14 | 1 | 13 |
| Tumor | No focal lesion | 27 | 5 | 22 |
| | Benign | 16 | 15 | 1 |
| | HCC | 20 | 7 | 13 |
| | CCC | 1 | 0 | 1 |
| | Metastasis | 8 | 7 | 1 |
| | Total Cancer | 29 | 14 | 15 |

FIG. 3

| | No HCC | HCC | Mean difference | p value |
|---|---|---|---|---|
| **Age (years)** | 53 ± 14 | 67 ± 9 | N/A | **<0.001** |
| **Subcutaneous fat area ($cm^2$)** | 271 ± 115 | 234 ± 106 | - 14% | 0.216 |
| **Visceral fat area ($cm^2$)** | 202 ± 109 | 266 ± 117 | **+ 32%** | **0.033** |
| **Total fat area ($cm^2$)** | 473 ± 157 | 500 ± 155 | + 6% | 0.515 |
| **PDFF (%) : Psoas** | 3.6 ± 2.5 | 4.0 ± 2.0 | + 11% | 0.529 |
| **PDFF (%) : Quadratus Lumborum** | 3.0 ± 2.2 | 4.7 ± 3.6 | **+ 58%** | **0.021** |
| **PDFF (%) : Erector Spinae** | 5.7 ± 3.0 | 9.6 ± 5.5 | **+ 69%** | **<0.001** |
| **PDFF (%) : Oblique** | 9.3 ± 5.5 | 10.6 ± 6.6 | + 14% | 0.409 |
| **PDFF (%) : Rectus** | 8.1 ± 7.0 | 7.2 ± 5.7 | - 11% | 0.657 |

**FIG. 4**

| | NAFLD (n=72) | |
|---|---|---|
| **Variables** | **p value** | **Bêta coefficient** |
| **Age** | **0.003** | **0.42** |
| **Sex** | **0.036** | **- 0.26** |
| **Activity score (A1-4)** | 0.528 | 0.10 |
| **Fibrosis score (F1-4)** | 0.608 | - 0.08 |
| **Visceral Fat area (cm²)** | 0.787 | 0.27 |
| **HCC presence** | **0.014** | **0.29** |
| Linear multiple regression of Erector Spinae PDFF prediction | | |

FIG. 5

| | NAFLD (n=72) | | | | NASH (n=38) | | | |
|---|---|---|---|---|---|---|---|---|
| Variables | p value of HCC prediction for $ES_{PDFF}$ | Odds ratio per unit increase (95% CI) | Odds ratio per SD increase (95% CI) | AUROC (95% CI) | p value of HCC prediction for $ES_{PDFF}$ | Odds ratio per unit increase (95% CI) | Odds ratio per SD increase (95% CI) | AUROC (95% CI) |
| Unadjusted | 0.002 | 1.27 (1.09 – 1.48) | 2.75 (1.46 – 5.2) | 0.72 (0.57 – 0.86) | 0.006 | 1.35 (1.09 – 1.68) | 3.61 (1.45 – 9.00) | 0.79 (0.63 – 0.96) |
| Sex, age adjusted | 0.045 | 1.19 (1.00 – 1.41) | 2.08 (1.02 – 4.26) | 0.84 (0.73 – 0.94) | 0.046 | 1.52 (1.01 – 2.30) | 5.88 (1.03 – 33.56) | 0.93 (0.85 – 1.00) |
| Multivariate model 1 | 0.041 | 1.19 (1.01 – 1.41) | 2.09 (1.03 – 4.25) | 0.84 (0.73 – 0.94) | 0.030 | 1.62 (1.05 – 2.51) | 7.78 (1.22 – 49.61) | 0.94 (0.87 – 1.00) |
| Multivariate model 2 | 0.046 | 1.19 (1.00 – 1.40) | 2.06 (1.01 – 4.20) | 0.84 (0.73 – 0.95) | 0.030 | 1.62 (1.05 – 2.51) | 7.78 (1.22 – 49.61) | 0.94 (0.87 – 1.00) |
| Multivariate model 3 | 0.045 | 1.19 (1.00 – 1.40) | 2.08 (1.02 – 4.26) | 0.84 (0.73 – 0.95) | 0.037 | 1.58 (1.03 – 2.44) | 6.98 (1.12 – 43.43) | 0.94 (0.87 – 1.00) |

**Multivariate model 1** was adjusted for age, sex and visceral fat area
**Multivariate model 2** was adjusted for NASH activity (A0-1 vs A2+) in addition to factors included in model 1
**Multivariate model 3** was adjusted for histological fibrosis stage (F0-1 vs F2+) in addition to factors included in model

FIG. 6

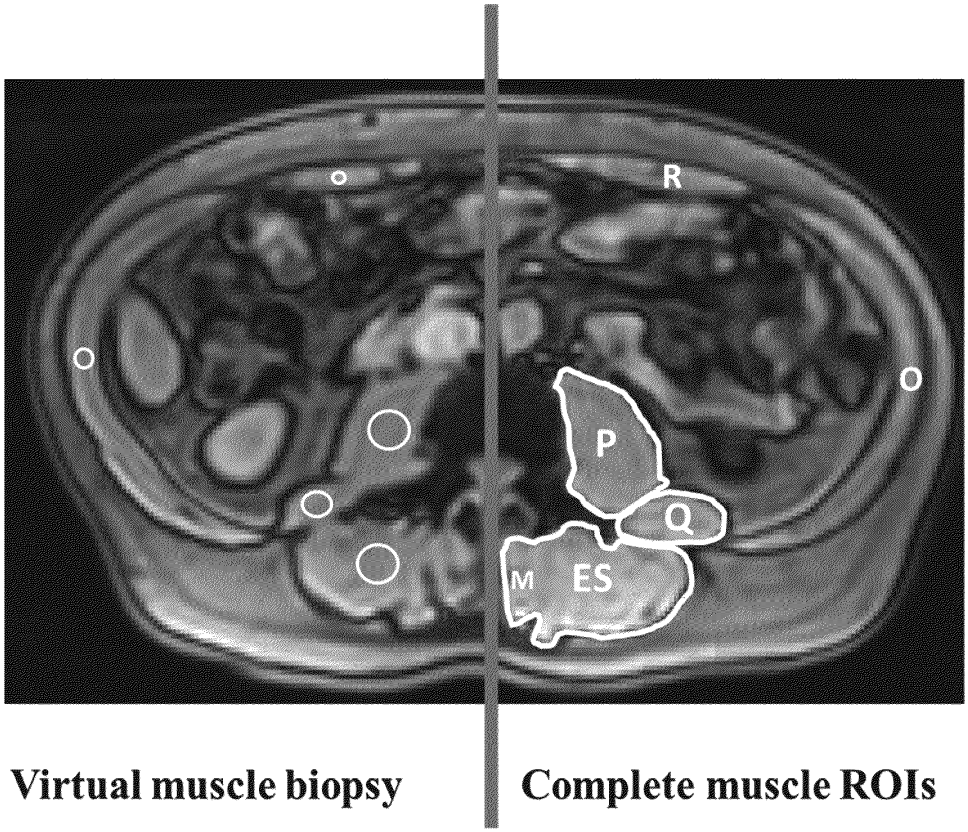



FIG. 7

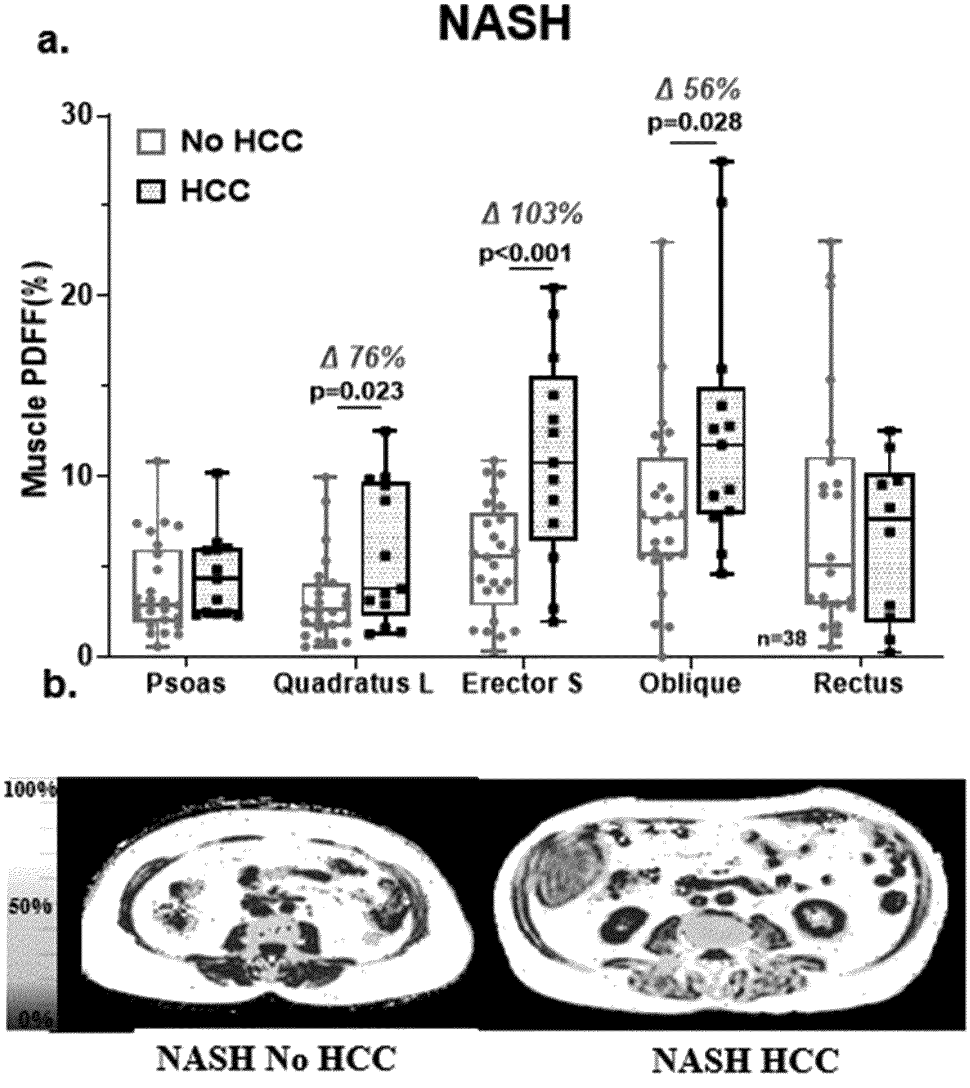

a.
NASH
30
20
10
0
Muscle PDFF(%)
No HCC
HCC
Δ 76%
p=0.023
Δ 103%
p<0.001
Δ 56%
p=0.028
n=38
b.
Psoas
Quadratus L
Erector S
Oblique
Rectus
100%
50%
0%
NASH No HCC
NASH HCC

FIG. 8

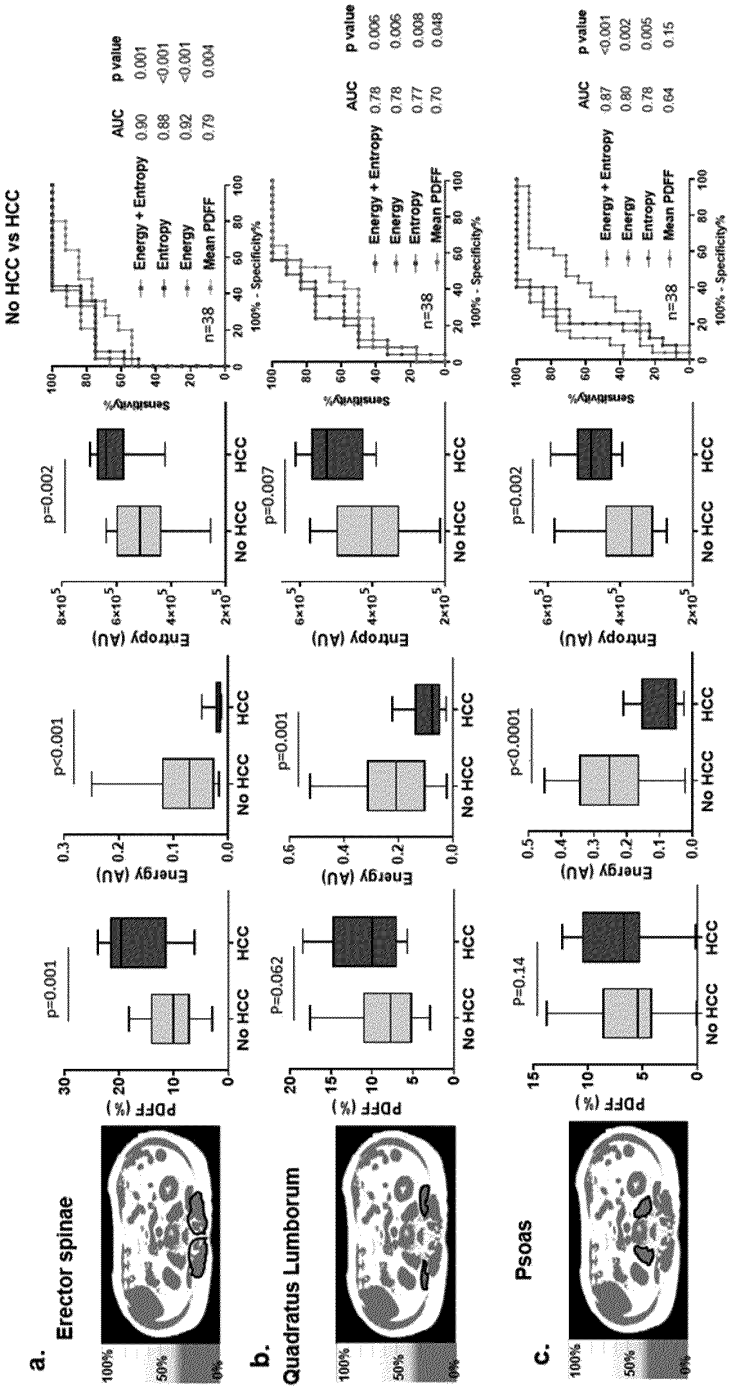

a.
Erector spinae
b.
Quadratus Lumborum
c.
Psoas
100%
50%
0%
PDFF (%)
p=0.001
p=0.062
P=0.14
Energy (AU)
p<0.001
p=0.001
p<0.0001
Entropy (AU)
p=0.002
p=0.007
p=0.002
No HCC
HCC
No HCC vs HCC
Sensitivity%
100% - Specificity%
n=38
Energy + Entropy
Entropy
Energy
Mean PDFF
AUC
p value
0.90 0.001
0.88 <0.001
0.92 <0.001
0.79 0.004
0.78 0.006
0.78 0.006
0.77 0.008
0.70 0.048
0.87 <0.001
0.80 0.002
0.78 0.005
0.64 0.15

FIG. 9

| | | HCC in NAFLD (n=20) | Chi-squared test |
|---|---|---|---|
| Fibrosis score | 0 | 4 | p=0.44 |
| | 1 | 4 | |
| | 2 | 2 | |
| | 3 | 4 | |
| | 4 | 6 | |

FIG. 10

| | (A) No focal lesion (n=27) | (B) Benign (n=16) | (C) HCC (n=20) | (D) CCC (n=1) | (E) Meta (n=8) | p value |
|---|---|---|---|---|---|---|
| PDFF (%) : Psoas | 4.1 ± 2.7 | 3.2 ± 2.3 | 4.0 ± 2.1 | / | 3.1 ± 2.2 | N.S. |
| PDFF (%) : Quadratus L. | 3.4 ± 2.7 | 1.9 ± 1.1 | 4.7 ± 3.7 | / | 3.3 ± 1.3 | **B vs C = 0.046** |
| PDFF (%) : Erector Spinae | 6.1 ± 3.4 | 5.3 ± 3.0 | 9.6 ± 5.5 | / | 5.0 ± 1.8 | **A vs C = 0.028**<br>**B vs C = 0.028**<br>C vs E = 0.060 |
| PDFF (%) : Oblique | 8.3 ± 5.0 | 9.5 ± 6.0 | 10.6 ± 6.6 | / | 10.1 ± 4.8 | N.S. |
| PDFF (%) : Rectus | 7.7 ± 6.5 | 8.1 ± 7.8 | 7.2 ± 5.7 | / | 7.5 ± 7.1 | N.S. |

Multiple comparison using one-way ANOVA followed by Benjamini-Horcberg post-hoc, with p value <0.1 denoted in full and p value >0.1 denoted as N.S.

Abbreviation: HCC, hepatocellular carcinoma; CCC, cholangiocarcinoma; Meta, metastasis.

NB: CCC were excluded since n=1

FIG. 11

| Erector spinae PDFF | | No HCC | HCC | Odds ratio (95% CI) | Relative risk (95% CI) | p value |
|---|---|---|---|---|---|---|
| Optimal Sensitivity<br>Se: 0.86 (0.60 – 0.97)<br>Sp: 0.46 (0.28 – 0.65) | <5.3% | 12 | 2 | 5.1 (0.9 – 25.6) | 1.6 (1.0 – 2.4) | p=0.0773 |
| | ≥5.3% | 13 | 11 | | | |
| Youden index<br>Se: 0.69 (0.42 – 0.87)<br>Sp: 0.84 (0.65 – 0.93) | <8.6% | 21 | 4 | 11.8 (2.2 – 54.8) | 2.7 (1.4 – 6.7) | p=0.0028 |
| | ≥8.6% | 4 | 9 | | | |
| Optimal specificity<br>Se : 0.54 (0.29 – 0.77)<br>Sp: 0.96 (0.81 – 1.00) | <10.5% | 24 | 6 | 28.0 (3.2 – 323.9) | 6.4 (1.7 -35.9) | p=0.0009 |
| | ≥10.5% | 1 | 7 | | | |

Sensitivity and specificity, Odds ratio and Relative Risk computed with Wilson/Brown, Baptista-Pike and Koopman asymptotic score methods, respectively.
P value computed with Fischer's exact test.

FIG. 12

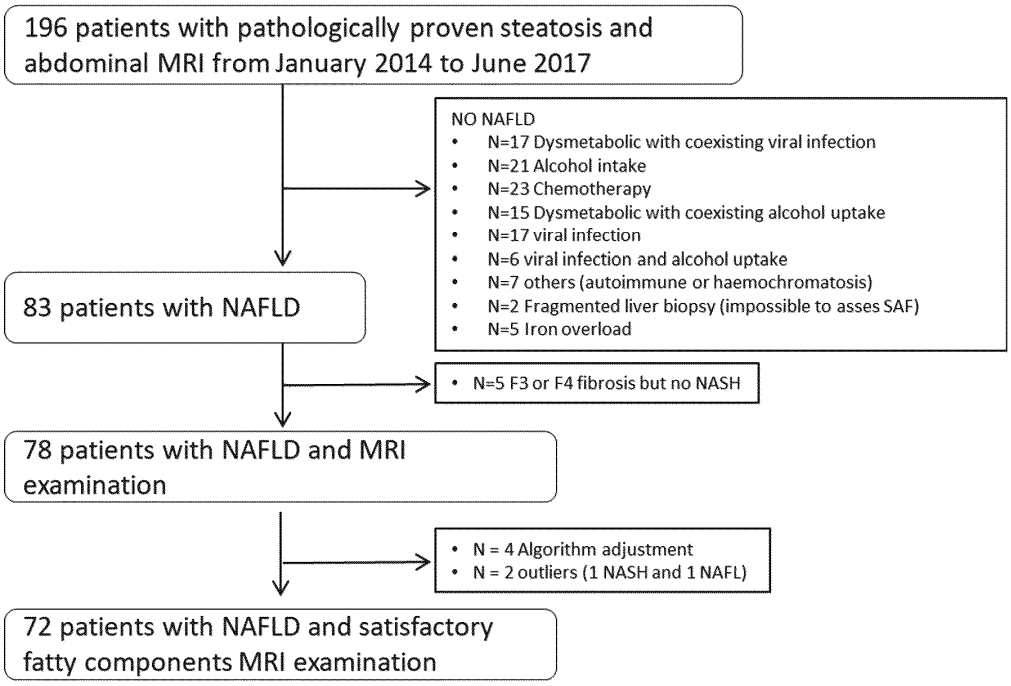

196 patients with pathologically proven steatosis and abdominal MRI from January 2014 to June 2017
NO NAFLD
N=17 Dysmetabolic with coexisting viral infection
N=21 Alcohol intake
N=23 Chemotherapy
N=15 Dysmetabolic with coexisting alcohol uptake
N=17 viral infection
N=6 viral infection and alcohol uptake
N=7 others (autoimmune or haemochromatosis)
N=2 Fragmented liver biopsy (impossible to asses SAF)
N=5 Iron overload
83 patients with NAFLD
N=5 F3 or F4 fibrosis but no NASH
78 patients with NAFLD and MRI examination
N = 4 Algorithm adjustment
N = 2 outliers (1 NASH and 1 NAFL)
72 patients with NAFLD and satisfactory fatty components MRI examination

FIG. 13

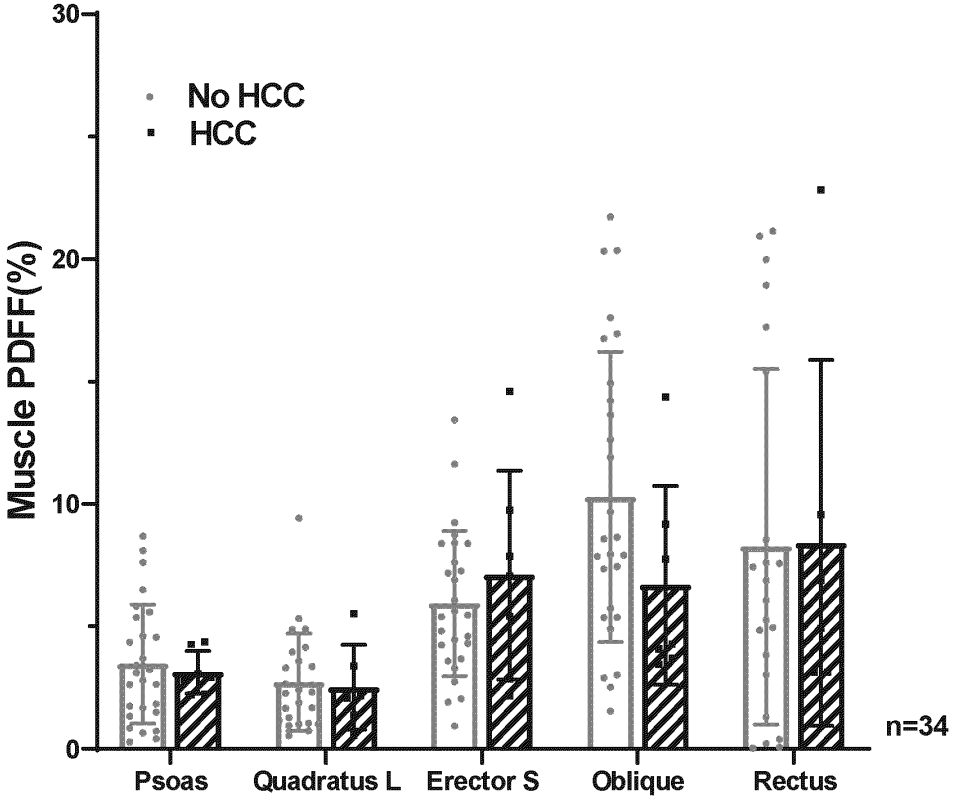

30
20
10
0
Muscle PDFF(%)
No HCC
HCC
n=34
Psoas
Quadratus L
Erector S
Oblique
Rectus

FIG. 14

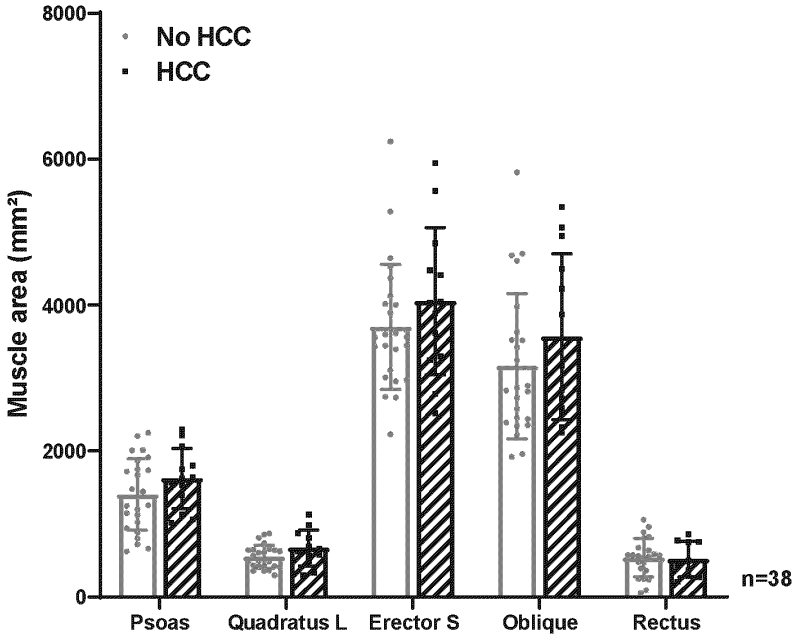



FIG. 15a

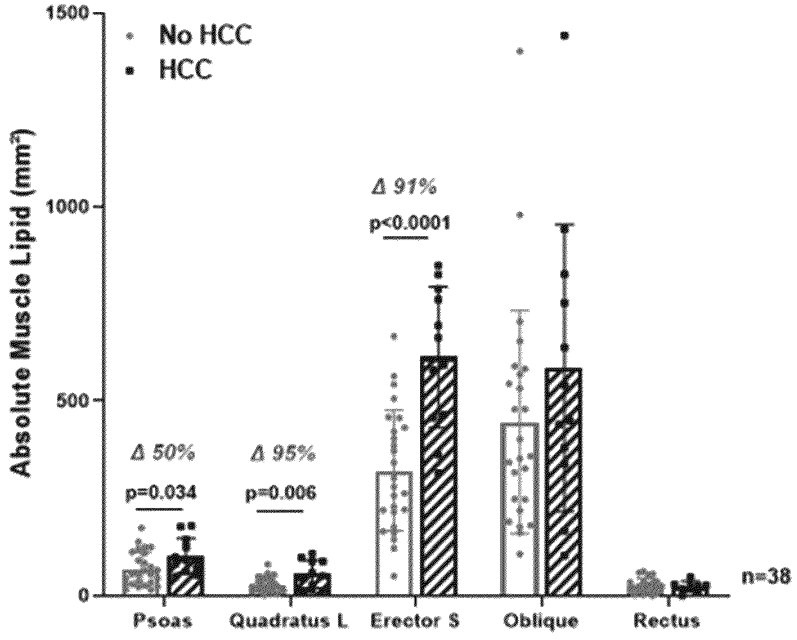



FIG. 15b

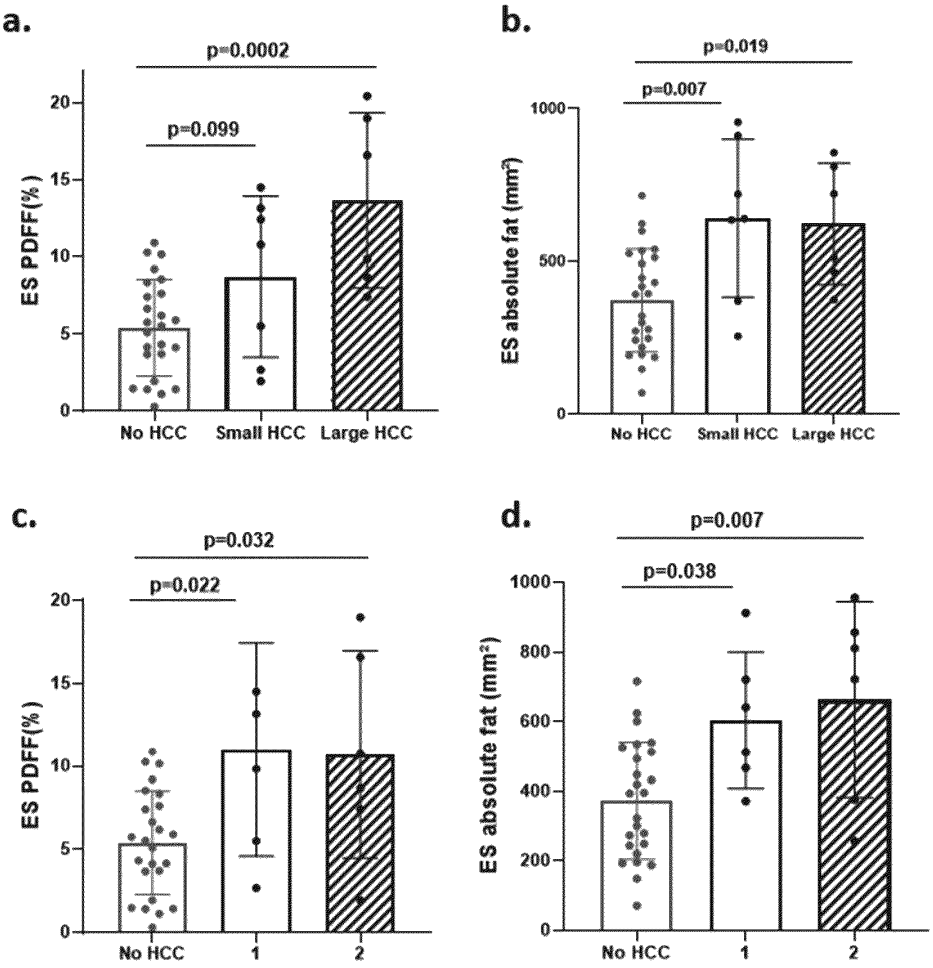

a.
p=0.0002
p=0.099
ES PDFF(%)
No HCC
Small HCC
Large HCC
b.
p=0.019
p=0.007
ES absolute fat (mm²)
No HCC
Small HCC
Large HCC
c.
p=0.032
p=0.022
ES PDFF(%)
No HCC
1
2
d.
p=0.007
p=0.038
ES absolute fat (mm²)
No HCC
1
2

FIG. 16

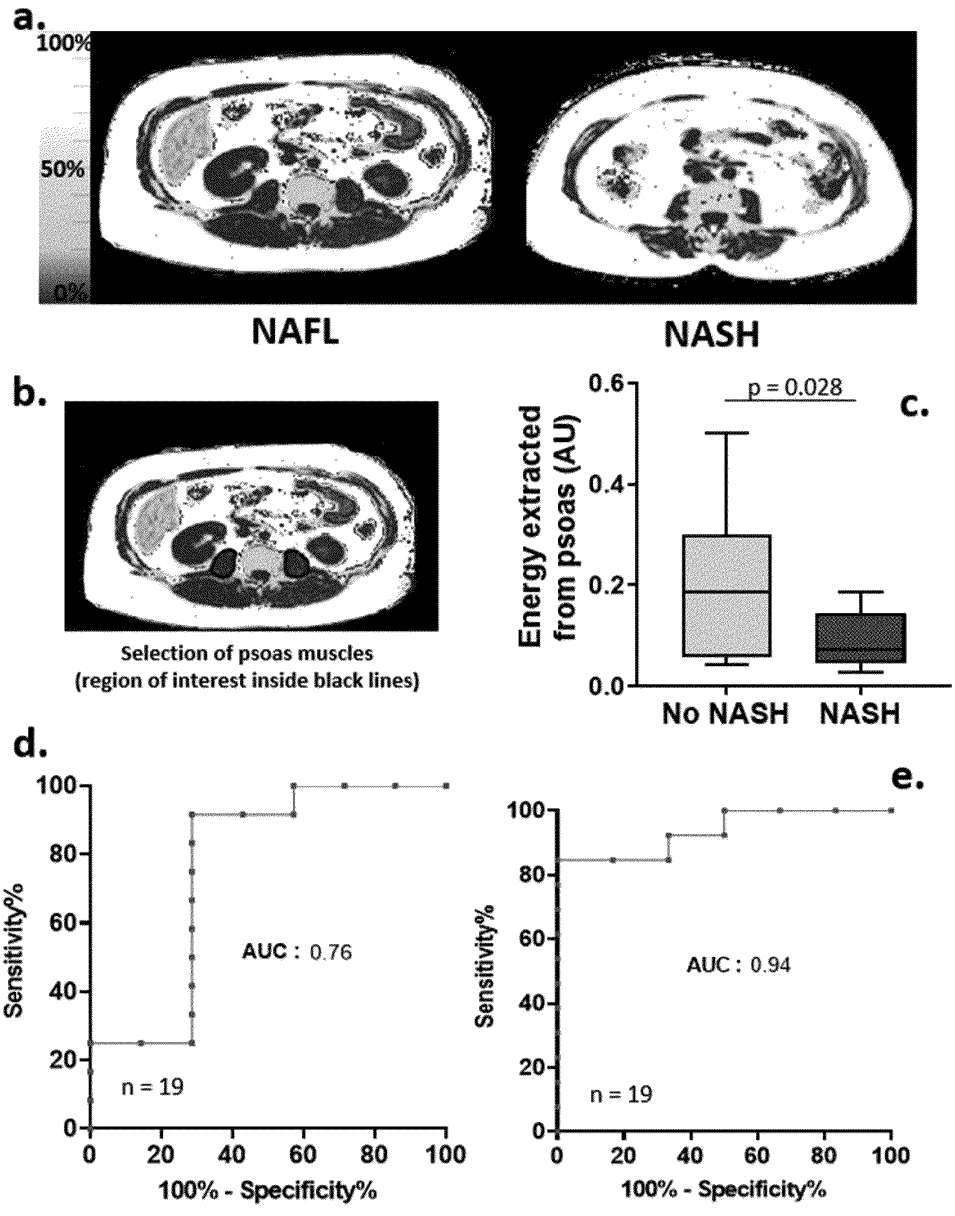

a.
100%
50%
0%
NAFL
NASH
b.
Selection of psoas muscles
(region of interest inside black lines)
c.
p = 0.028
Energy extracted from psoas (AU)
0.6
0.4
0.2
0.0
No NASH
NASH
d.
Sensitivity%
100% - Specificity%
AUC : 0.76
n = 19
e.
Sensitivity%
100% - Specificity%
AUC : 0.94
n = 19

FIG. 17

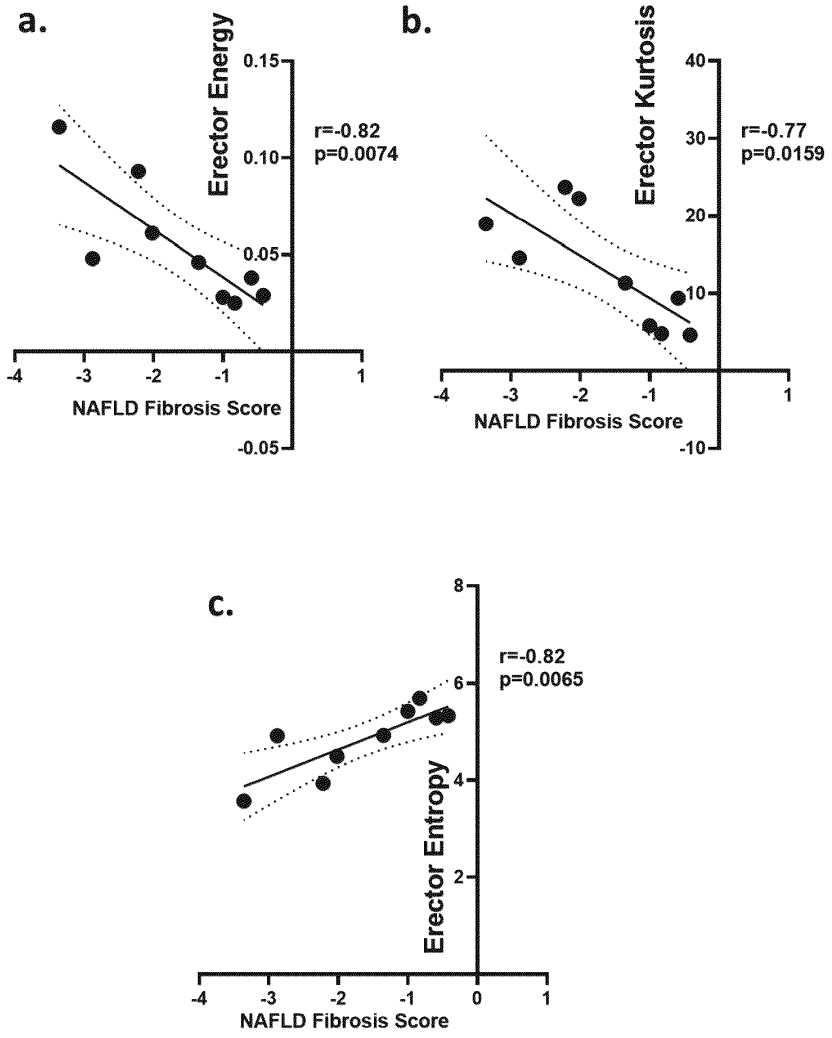

a.
Erector Energy
0.15
0.10
0.05
-0.05
r=-0.82
p=0.0074
-4
-3
-2
-1
1
NAFLD Fibrosis Score
b.
Erector Kurtosis
40
30
20
10
-10
r=-0.77
p=0.0159
-4
-3
-2
-1
1
NAFLD Fibrosis Score
c.
Erector Entropy
8
6
4
2
r=-0.82
p=0.0065
-4
-3
-2
-1
0
1
NAFLD Fibrosis Score

FIG. 18

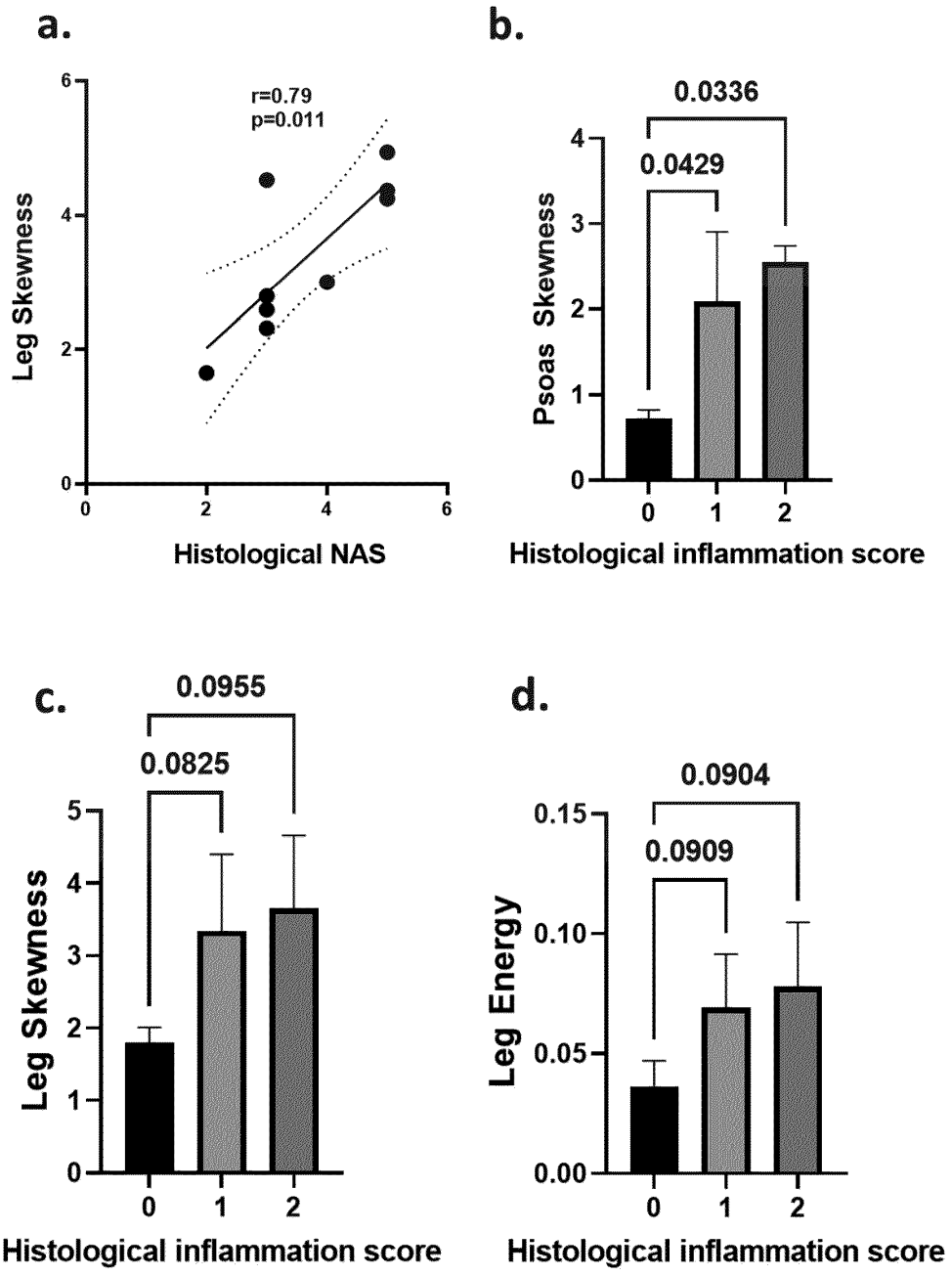

a.
r=0.79
p=0.011
Leg Skewness
Histological NAS
b.
0.0336
0.0429
Psoas Skewness
Histological inflammation score
c.
0.0955
0.0825
Leg Skewness
Histological inflammation score
d.
0.0904
0.0909
Leg Energy
Histological inflammation score

FIG. 19

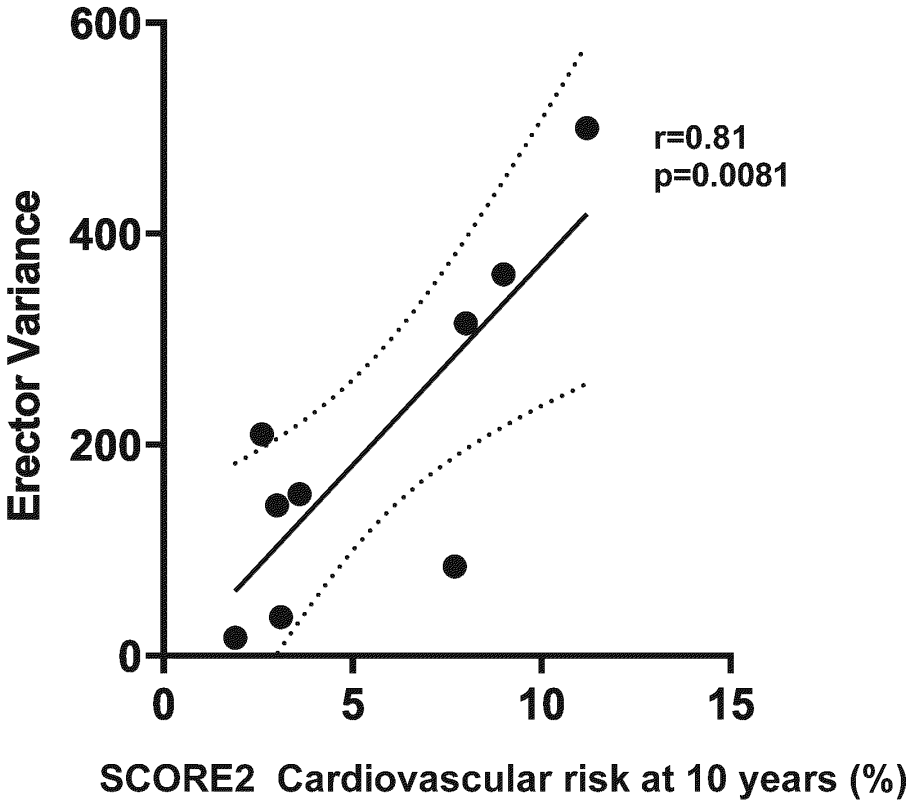

600
400
200
0
Erector Variance
0
5
10
15
SCORE2 Cardiovascular risk at 10 years (%)
r=0.81
p=0.0081

FIG. 20