

SUPPLEMENTARY DATA

CT-scan based liver and spleen volume measurement as a prognostic indicator for patients with cirrhosis

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Supplementary Table 1: Baseline characteristics, laboratory values, and liver and splenic volume measurements stratified by Child Pugh Classification.

Variables	Child Class A (N=202)	Child Class B (N=292)	Child Class C (N=62)	p-value
Age (Yrs)	56.4±10.4	55.7±10.1	54.8±9.3	0.5314
Gender (Men, n %)				
Race (Whites, n %)				
Body weight (Kg)	85.4±19.2	87.5±21.6	90.7±25.6	0.2053
Height (cm)	169.7±13.1	171.3±13.5	171.3±9.7	0.3927
Body mass index (kg/m ²)	29.4±6.3	30.6±13.7	30.9±8.3	0.4053
White blood cell counts (x10 ³ /mm ³)	5.6±3.5	5.5±3.0	7.6±3.8	<0.0001
Hemoglobin (g/dl)	13.4±6.2	12.2±7.7	11.3±2.2	0.0166
Platelet counts (x10 ³ /mm ³)	122.1±66.6	106.8±86.7	95.1±55.2	0.0216
Blood urea nitrogen (mg/dl)	14.5±8.8	14.2±10.9	20.4±23.9	0.0016
Creatinine (mg/dl)	1.2±1.5	1.0±1.1	1.4±2.7	0.0870
Total bilirubin (mg/dl)	1.2±0.5	2.4±2.1	7.4±6.6	<0.0001
Alanine aminotransferase (ALT, U/L)	48.4±44.7	49.7±56.0	55.2±65.4	0.4997
Aspartate aminotransferase (AST, U/L)	55.2±45.2	76.7±64.9	101.2±97.3	0.0006
Alkaline phosphatase (ALP, U/L)	110.9±70.7	154.0±164.3	164.0±192.8	0.0005
Albumin (g/dl)	3.6±0.5	2.8±0.5	2.4±0.5	<0.0001
Total protein (g/dl)	7.6±5.2	6.9±0.9	6.6±1.0	0.0101
International normalized ratio (INR)	1.2±0.1	1.6±1.5	4.5±20.3	0.0022
MELD scores	8.4±5.0	11.3±6.0	21.0±1.0	<0.0001
Liver volume without body weight adjustment				
Total liver volume (TLV, cm ³)	1754.0±562.3	1621.4±541.0	1464.3±583.5	0.0007
Functional liver volume (FLV, cm ³)	1676.9±573.4	1576.7±527.6	1424.9±565.2	0.0061
Segment 1 volume (cm ³)	48.2±47.5	49.0±48.6	43.6±36.7	0.7071
Segment 2 volume (cm ³)	271.4±266.8	249.1±112.8	244.5±155.8	0.4225
Segment 3 volume (cm ³)	209.0±175.4	179.0±115.6	143.3±97.2	0.0016
Segment 4 volume (cm ³)	262.2±150.9	251.2±125.9	244.8±234.4	0.3214
Segment 5 volume (cm ³)	255.6±170.5	223.8±123.3	207.4±107.2	0.0058

Segment 6 volume (cm ³)	177.6±109.1	158.4±119.5	145.9±120.8	0.3885
Segment 7 volume (cm ³)	263.7±112.8	242.2±128.0	228.8±111.8	0.1180
Segment 8 volume (cm ³)	242.7±100.0	227.1±111.1	202.1±100.1	0.0236
Liver volume with body weight adjustment				
Total volume:body weight (cm ³ :kg)	21.1±7.1	19.5±10.3	17.2±8.7	0.0023
functional volume:body weight (cm ³ :kg)	20.2±7.1	19.0±10.0	16.7±8.4	0.0103
Segment 1:BW (cm ³ /kg)	0.6±0.6	0.6±0.6	0.5±0.4	0.4929
Segment 2:BW (cm ³ /kg)	3.2±2.5	3.0±2.0	2.9±2.4	0.5596
Segment 3:BW (cm ³ /kg)	2.5±2.1	2.1±1.9	1.7±1.3	0.0053
Segment 4:BW (cm ³ /kg)	3.2±1.9	3.0±2.0	2.8±2.6	0.2142
Segment 5:BW (cm ³ /kg)	3.1±2.0	2.7±1.8	2.4±1.4	0.0053
Segment 6:BW (cm ³ /kg)	2.1±1.3	2.9±1.5	1.7±2.0	0.2714
Segment 7:BW (cm ³ /kg)	3.2±1.5	2.9±1.9	2.7±1.5	0.0623
Segment 8:BW (cm ³ /kg)	2.0±1.2	2.7±1.5	2.3±1.3	0.0102
Splenic volume with and without body weight adjustment				
Total splenic volume (cm ³)	676.0±440.7	871.8±545.1	831.7±467.0	0.0001
Functional splenic volume (cm ³)	655.3±427.8	843.7±529.1	808.8±455.1	0.0001
Total splenic volume:BW (cm ³ /kg)	7.9±5.0	10.5±8.1	9.3±4.8	0.0002
Functional splenic volume:BW (cm ³ /kg)	7.6±4.9	10.1±7.8	9.0±4.7	0.0002
Total liver to spleen ratio	4.0±2.9	2.8±3.5	2.3±1.5	<0.0001
Functional liver to spleen ratio	3.9±2.8	2.8±3.5	2.3±1.5	<0.0001

Supplementary Table 2: Baseline characteristics, laboratory values, and liver volume measurements stratified by outcomes during follow up.

Variables	Alive (N=316)	Transplanted (N=111)	Dead (N=126)	p-value
Age (Yrs)	55.7±10.1	53.4±10.0	58.3±9.7	0.0006
Gender (Men, n %)				0.3758
Race (Whites, n %)				0.5741
Body weight (Kg)	87.2±20.5	88.7±19.8	85.6±24.3	0.5484
Height (cm)	170.2±13.6	172.6±14.0	170.3±10.4	0.2293
Body mass index (kg/m ²)	30.6±13.0	30.1±8.5	29.4±7.4	0.6132
White blood cell counts (x10 ³ /mm ³)	5.7±3.0	5.2±4.1	6.4±3.5	0.0264
Hemoglobin (g/dl)	12.6±3.0	12.0±2.4	12.7±11.2	0.6358
Platelet counts (x10 ³ /mm ³)	120.5±84.5	88.6±44.4	107.5±77.0	0.0021
Blood urea nitrogen (mg/dl)	14.2±10.6	14.1±7.6	17.9±18.8	
Creatinine (mg/dl)	1.1±1.4	1.0±0.9	1.3±2.0	0.3689
Total bilirubin (mg/dl)	2.2±3.0	2.6±1.9	3.7±4.7	<0.0001
Alanine aminotransferase (ALT, U/L)	56.2±106.7	53.6±63.4	48.0±34.2	0.6753
Aspartate aminotransferase (AST, U/L)	77.2±134.2	78.5±71.8	78.9±48.6	0.9875
Alkaline phosphatase (ALP, U/L)	125.1±96.1	142.7±92.7	139.1±143.1	0.2387
Albumin (g/dl)	3.1±0.6	3.0±0.7	2.8±0.6	<0.0001
Total protein (g/dl)	7.2±4.2	7.0±0.9	6.9±1.0	0.5408
International normalized ratio (INR)	1.3±0.8	2.9±15.3	1.5±0.5	0.1150
MELD scores	10.4±6.0	12.2±7.1	14.1±8.6	<0.0001
Total liver volume (TLV, cm ³)	1736.4±610.4	1514.8±534.0	1510.6±568.3	<0.0001
Functional liver volume (FLV, cm ³)	1676.4±602.6	1482.9±490.0	1468.0±558.6	0.0003
Segment 1 volume (cm ³)	45.9±49.1	42.0±42.4	49.7±50.0	0.4803
Segment 2 volume (cm ³)	257.5±126.0	278.2±336.4	242.2±138.2	0.3453

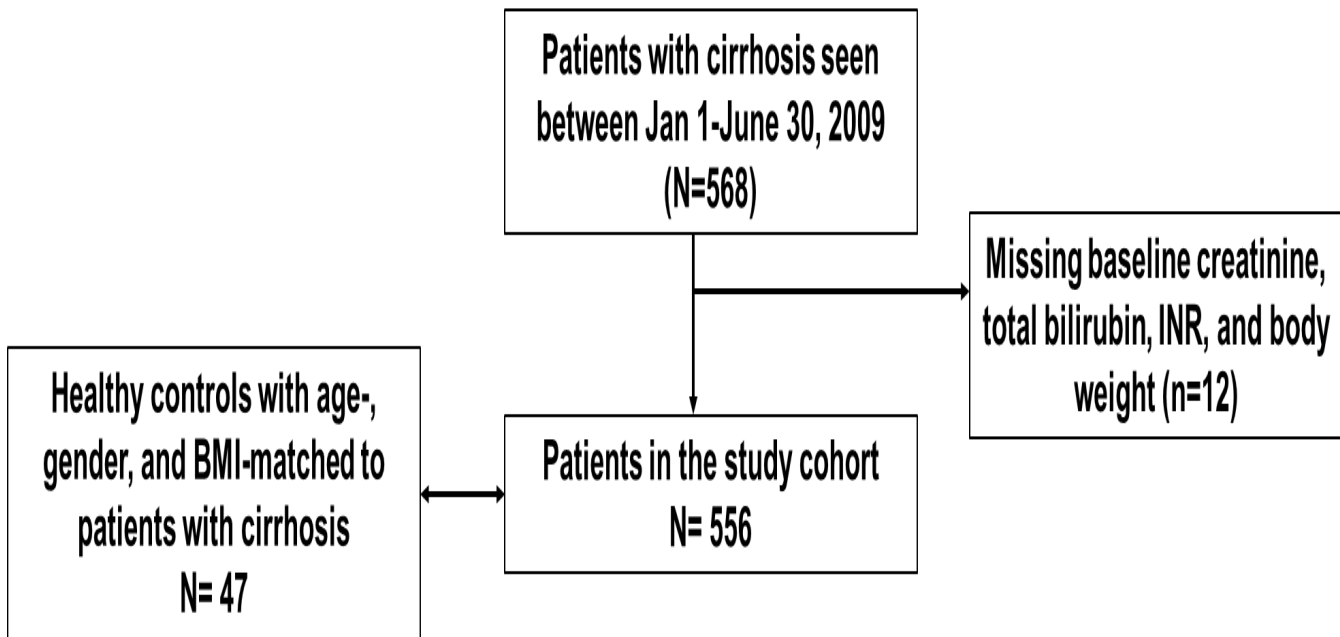
Segment 3 volume (cm ³)	201.9±157.0	162.7±104.1	159.8±113.4	0.0031
Segment 4 volume (cm ³)	261.0±153.0	235.4±126.3	227.9±179.1	0.0804
Segment 5 volume (cm ³)	248.1±155.6	206.5±118.0	206.4±113.8	0.0029
Segment 6 volume (cm ³)	175.2±146.8	147.8±97.4	167.4±238.6	0.3244
Segment 7 volume (cm ³)	268.4±136.7	226.6±104.6	228.4±111.3	0.0009
Segment 8 volume (cm ³)	245.2±105.1	216.8±100.9	208.4±97.6	0.009
Total volume:body weight (cm ³ :kg)	20.7±9.2	17.7±7.7	18.5±7.3	0.0017
functional volume:body weight (cm ³ :kg)	20.0±9.1	17.3±7.2	17.9±7.1	0.0041
Segment 1:BW (cm ³ /kg)	0.5±0.6	0.5±0.5	0.6±0.7	0.1398
Segment 2:BW (cm ³ /kg)	3.1±1.9	3.2±3.1	3.0±1.9	0.8085
Segment 3:BW (cm ³ /kg)	2.4±2.2	1.9±1.3	2.0±1.4	0.0060
Segment 4:BW (cm ³ /kg)	3.1±2.1	2.7±1.7	2.8±2.1	0.0868
Segment 5:BW (cm ³ /kg)	2.9±1.9	2.4±1.5	2.5±1.3	0.0047
Segment 6:BW (cm ³ /kg)	2.1±1.6	1.7±1.3	2.0±2.6	0.2989
Segment 7:BW (cm ³ /kg)	3.2±1.7	2.7±1.4	2.8±1.4	0.0042
Segment 8:BW (cm ³ /kg)	2.9±1.3	2.5±1.3	2.5±1.2	0.0037
Splenic volume with and without body weight adjustment				
Total splenic volume (cm ³)	778.9	946.9±594.6	720.5±451.5	0.0015
Functional splenic volume (cm ³)	754.6	916.2±576.7	698.8±438.8	0.0017
Total splenic volume:BW (cm ³ /kg)	9.3±7.6	10.8±6.5	18.5±7.3	0.0017
Functional splenic volume:BW (cm ³ /kg)	9.0±7.4	10.4±6.3	17.9±7.1	0.0308
Total liver to spleen ratio	3.3±2.9	2.2±1.5	3.5±4.5	0.0017
Functional liver to spleen ratio	3.3±2.9	2.2±1.5	3.5±4.5	0.0024

Figure legends

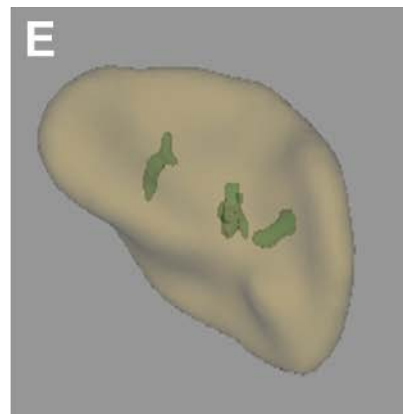
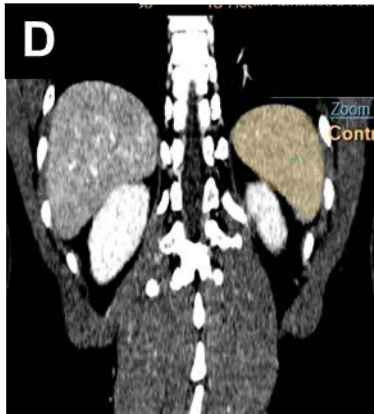
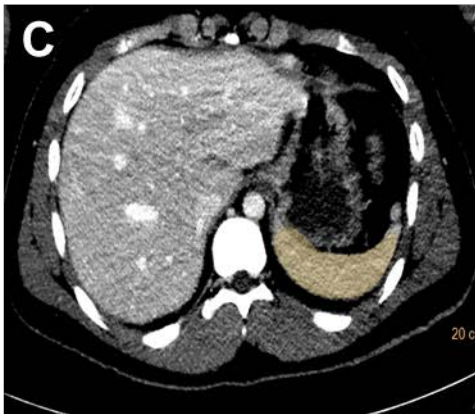
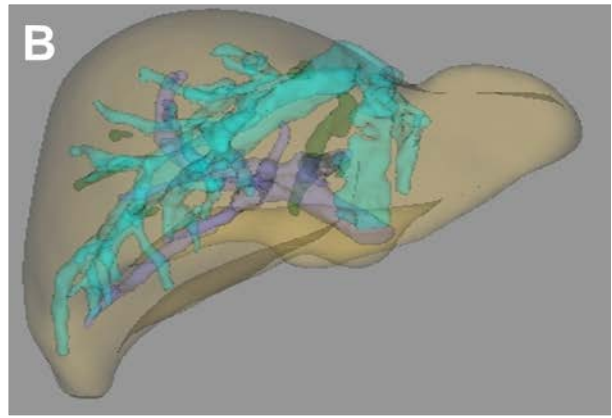
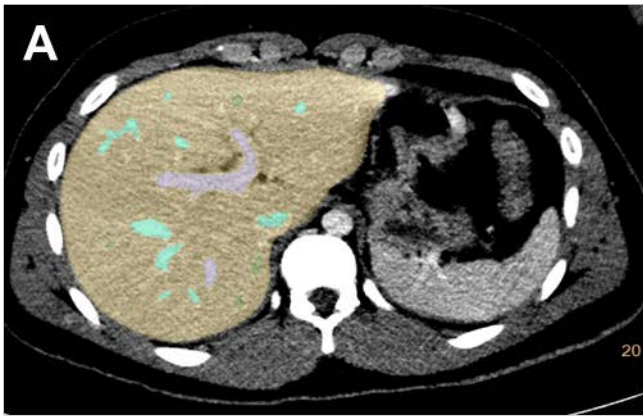
Supplementary Figure 1: Schematic diagram on patient selection into the study cohort

Supplementary Fig 2: Schematic illustration demonstrating semi-automated liver and spleen volume measurement

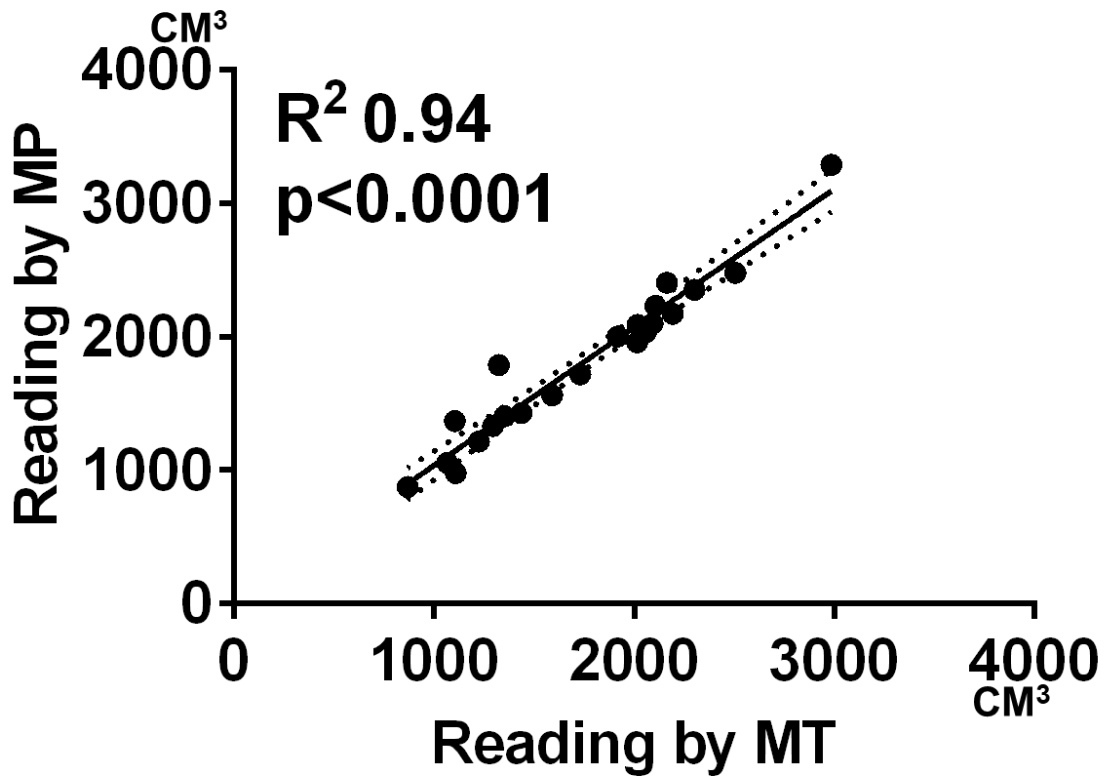
Supplementary Fig 3: Linear regression analysis illustrating the inter-observer agreement between 2 readers (data shown are the reading of liver volume)



Supplementary Figure 1: Schematic diagram on patient selection into the study cohort



Supplementary Fig 2: Schematic illustration demonstrating semi-automated liver and spleen volume measurement



Supplementary Fig 3: Linear regression analysis illustrating the inter-observer agreement between 2 readers (data shown are the reading of liver volume)