

Differences in liver stiffness values obtained with new ultrasound elastography machines and Fibroscan: A comparative study.

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Key point for Fibroscan users

Take-Home Messages

- 1- When compared to other techniques, liver stiffness estimates by Aixplorer SSI-SWE are **the closest** to those from FibroScan (**highest accuracy**), whatever the value (**highest precision**).
- 2- This is valid regardless of intercostal space used with either technique, and also in patients where skin-capsule distance ≥ 2 cm.
- 3- SWE mapping techniques (like Aixplorer SSI-SWE) have **higher technical success rates** than Point-Quantification techniques, especially in patients with liver stiffness ≥ 10 kPa with FibroScan
- 4- Aixplorer SSI-SWE is the only technique for which **diagnostic cutoff** established for FibroScan may be applicable.

Objective of the study

To test the concordance of liver stiffness measurements obtained from 7 of the most recent ultrasound elastography machines with respect to Fibroscan.

in that work Fibroscan is used as goldstandard

Material & Methods

Patients

Only patients with valid TE

16 patients with hepatitis C virus-related liver disease, and successful and reliable TE results (Success Rate (SR) $\geq 60\%$ and interquartile range (IQR)/median < 0.30)

Study Protocol

Patients were lying in supine position with right arm raised above head.

10 SWE measurements were performed in the same intercostal space as TE.

10 additional SWE measurements were performed in an alternative intercostal space.

All values were expressed in kiloPascals (conversion applied to ARFI VTTQ measurements)

Ultrasound equipment

7 ultrasound systems in addition to FibroScan

- **Aixplorer Supersonic** (convex probe **XC6-1**, software version 10.0.0.1815) [real time 2D SWE]
- Esaote MyLab Twice (convex probe CA451, software version EVO13.0 release 12.11) [pSWE]
- GE Logiq E9 (convex probe C1-6, software version R5 revision 1.0) [2D single shot SWE]
- Hitachi Arietta V70 version 3.0.1 (convex probe EUP-C532, software version 00-3.0.1) [pSWE]
- Philips iU22 ELASTPQ (convex probe C1-5, software version 6.3.2.2) [pSWE]
- Samsung RS80A Ugeo (convex probe CA1-7, software version 2.00.03.0629) [pSWE]
- Siemens, Acuson S2000 version VD10A (convex probe 6C1 HD) [pSWE]

Statistical analysis

The SWE techniques were compared with Fibroscan using Lin's Concordance Correlation Coefficient (CCC). Lin's CCC allows to evaluate Pearson correlation coefficient for both:

- 1- **Precision** of measurement (dispersion compared to regression line): the higher Pearson, the lower the dispersion
- 2- **Accuracy** of measurement (difference of regression line with TE reference values): the higher Pearson, the closer to TE measurements

Results

Concordance analysis of SWE techniques versus TE

SWE measurements from TE intercostal space:

- Aixplorer: **highest** Precision (0.727)
- Aixplorer: **highest** Accuracy (0.871)

SWE measurements from 2 intercostal spaces:

- Aixplorer: **highest** Precision (0.900)
- Aixplorer: **highest** Accuracy (0.992)

In patients with skin-capsule distance < 2 cm:

- Aixplorer: among **Top 5** for Precision (> 0.900)
- Aixplorer: among **Top 3** for Accuracy (> 0.900)

In patients with skin-capsule distance ≥ 2 cm:

- Aixplorer: **highest** Precision (0.667)
- Aixplorer: **highest** Accuracy (0.936)

Technical Success Rates

"The Success Rate was **overtly better** for **bidimensional SWE** techniques than for pSWE and Fibroscan."

"[...] for almost all pSWE systems, and for Fibroscan as well, the **SRs were substantially poorer** in livers showing a stiffness ≥10 kPa at Fibroscan."

Conclusions

"[...] new ultrasound elastography machines tend to have moderate to high precision in measuring liver stiffness in HCV-related patients in comparison to Fibroscan which indicates that **they have good potential for fibrosis assessment.**"

"[...] the accuracy was not high enough, **at least for the majority of them**, to adopt the thresholds already established with Fibroscan for fibrotic stage prediction and each machine must provide its own data; [...]"

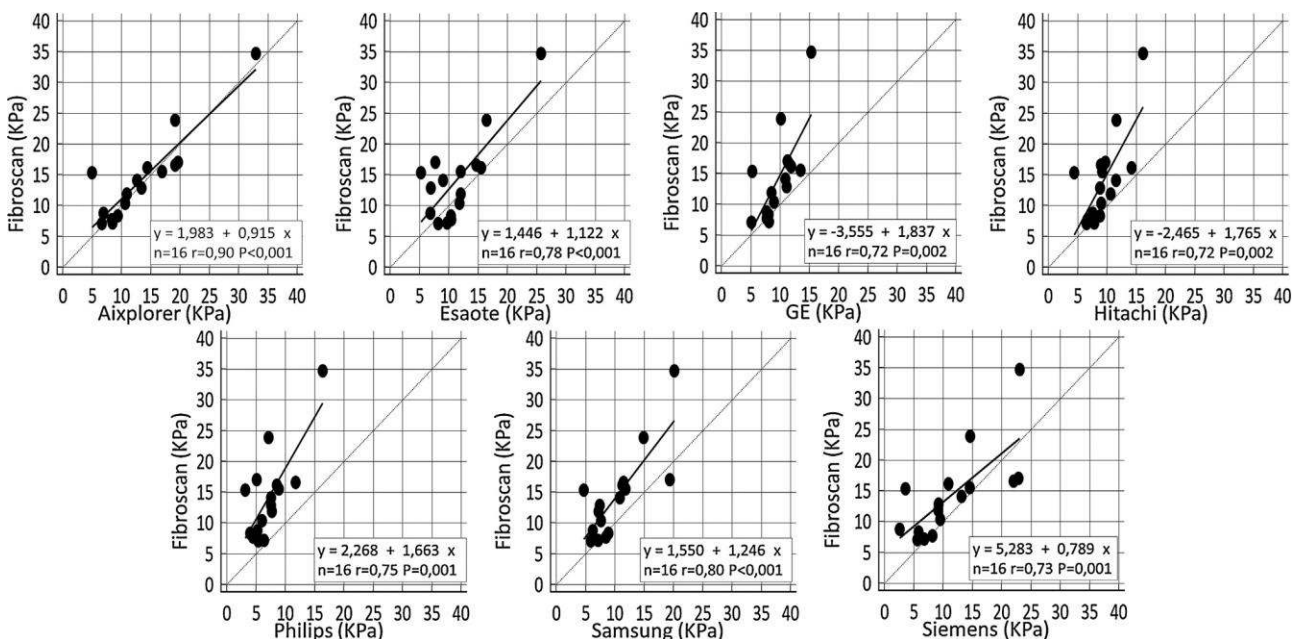


Figure: Comparison of each SWE technique versus Fibroscan in determining liver stiffness from two intercostal spaces. Scatter plots obtained considering liver stiffness as the median of all 20 samplings achieved in the reference (10 measurements) and alternative (10 measurements) intercostal spaces. The results of each SWE machine (x axis) are plotted against the respective Fibroscan values (y axis). The regression line (thick) and the reference line ($y = x$; dashed) are drawn on each plot. The regression equation ($y = ax + by$), sample size (n), Pearson's coefficient (r) and p value (P) are reported in the box included with each comparison.

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