A comparison of Transient Elastography (TE) with Acoustic Radiation Force Impulse Elastography (ARFI) for the assessment of liver health in patients with Chronic Hepatitis C; baseline results from the TRACER study.

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Introduction

Chronic hepatitis C (HCV) can cause progressive liver disease, cirrhosis, liver failure, or hepatocellular carcinoma (1). Determining liver stiffness measurements (LSM) by noninvasive methods may be used as a prognostic marker among patients living with HCV (2-3). Transient elastography is performed using a FibroScan® (FS) device (Echosens, Paris, France) and Virtual Touch™ tissue quantification is a real-time measurement method that uses Acoustic Radiation Force Impulse (ARFI) imaging technology to determine tissue stiffness properties.

Objectives

This poster aimed to establish the FibroScan® scores and ARFI scores in a chronic Hepatitis C cohort. And determine the influence of different factors such as BMI, APRI score and FIB 4 score on the correlation between liver stiffness scores.

Methods

Patients were recruited to the Chronic Hepatitis C Treatment Radiographic and Clinical Outcomes Cohort (the TRACER Study), at the Mater Misericoradiae University Hospital and St. Vincent's University Hospital. LSM were acquired using FibroScan® and ARFI and the skin to liver capsular distance (SCD) at the right lobe was also noted. LSM were grouped into fibrosis scores using the FibroScan® scoring card (F0-F1,F2, F3 and F4). In order to directly compare TE scores to ARFI scores we converted the ARFI scores to kPa using the equation: $Y = 3c2$ where Y = Young's Modulus (kPa) c = Shear Wave Velocity (m/s). Aminotransferase-platelet ratio index (APRI) and Fibrosis-4 Score (FIB-4) were calculated as follows: APRI= AST(/ULN) x 100/platelet(x109/L) and FIB4= age x AST/(platelet count [x 109/L] x ALT1/2). Additional data collected included age, obesity class, genotype and presence of stigmata of chronic liver disease. Spearman rank correlation was used to measure the degree of association between FS and ARFI scores. In addition, we used the Bland-Altman method to assess the agreement between the scores. A multivariate regression model was also fitted with factors showing a significant association in univariate analyses. For all tests, a p value < 0.05 indicated statistically significant findings.

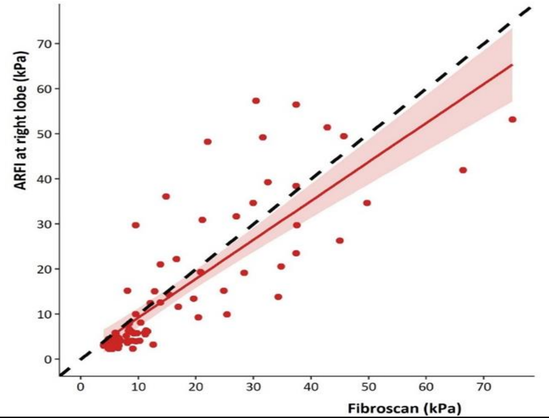
Results

- 88 patients were recruited to the study; median age was 44 (IQR 39, 50), 27.3% were female (n=24) and 72.7% were male (n=64).
- FS failed to obtain a score or obtained an unreliable score in 5 (5.7%) of patients, all of whom had raised BMI, but we achieved ARFI scores in all patients, regardless of BMI.
- We used Spearman's correlation test to identify the correlation between FS and ARFI. Overall, there was good correlation between the scores with a Spearman's coefficient (95% CI) of 0.87 (0.80, 0.91) – p<0.001. We started to see disagreement at higher readings of FS and ARFI with ARFI recording higher stiffness scores than FS at higher readings.

Table 1. Patient characteristics and descriptive statistics for study respondents at baseline visit

Characteristic	Description	All (n=88) n(%) or median (IQR)
Sex	Female	24 (27.3%)
	Male	64 (72.7%)
Stigmata of chronic liver disease	No	68 (77.3%)
	Yes	20 (22.7%)
Obesity class	Normal weight	35 (39.8%)
	Overweight	31 (35.2%)
	Class I obesity	14 (15.9%)
	Class II/III obesity	8 (9.1%)
Genotype	1a	47 (53.4%)
	3	34 (38.6%)
	Other	7 (7.9%)
FibroScan® score	Unobtainable/unreliable F0/F1	5 (5.7%)
		34 (38.6%)
	F2	16 (18.2%)
	F3	3 (3.4%)
	F4	30 (34.1%)
ARFI score at segment 5/8	F0/F1	32 (36.4%)
	F2	13 (14.8%)
	F3	5 (5.7%)
	F4	38 (43.2%)
FIB 4 score		1.8 (1.1, 3.7)
APRI score		0.8 (0.4, 2.1)

Figure 1. Scatter plot of FS and ARFI scores with line of best fit (in red) and of theoretical perfect agreement (in black) showing strong correlation between the scores.



- Average (95% CI) difference between FS and ARFI scores was 1.65 (-0.34, 3.64) kPa – p=0.10. There was no correlation between the difference and the average of the two scores [Spearman's r (95% CI) = -0.05 (-0.30, 0.12), p=0.39] , showing that FS and ARFI performed at the right lobe systematically produced similar measurements.
- We evaluated how several factors such as gender, genotype, BMI, and APRI and FIB4 scores affected the scores acquired with ARFI and FibroScan® and showed that BMI was the biggest influencing factor on the difference between ARFI and FibroScan® score. Every 5kg increase in BMI led to higher disagreement between the scores.

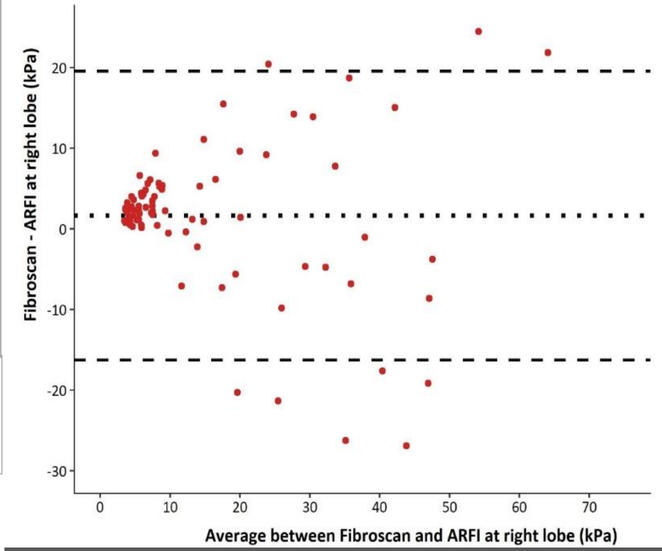


Figure 2. Bland-Altman plot of the difference (y-axis) and average (x-axis) of FS and ARFI scores which shows better agreement between the measurements at lower scores and poorer agreement at higher scores.

Conclusion

- We showed ARFI had similar predictive value to FS for the non-invasive assessment of liver fibrosis for measurements acquired at the right lobe.
- BMI was found to affect readings and as BMI increased there was greater disagreement between FibroScan® and ARFI scores.
- We suggest that ARFI is more widely adopted in clinical use, especially for patients with raised BMI.

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