

Prospective Comparison of MR Elastography and US Acoustic Radiation Force Impulse for Evaluation of Hepatic fibrosis

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Purpose:

Prevention of the progression of liver fibrosis to cirrhosis is essential because later stages of the disease are irreversible, resulting in liver failure and death if transplantation is not performed. Percutaneous liver biopsy is a commonly used method for establishing a diagnosis of liver fibrosis; however, the procedure is invasive and is contraindicated in patients with poor liver function¹. Less invasive techniques are, therefore, required to identify significant liver fibrosis in patients with chronic liver disease.

Magnetic resonance elastography (MRE) is a novel noninvasive imaging technique for detecting and staging fibrosis in patients with chronic liver disease. Acoustic radiation force impulse (ARFI) imaging is a new ultrasound-based elastography method for diagnosing hepatic fibrosis. Few studies have compared the clinical efficacy of each technique in the staging of hepatic fibrosis. The purpose of our study is to compare the diagnostic accuracy of ARFI and MRE and establish cutoff levels and diagnostic strategies for both techniques.

Methods:

We prospectively enrolled 53 patients with hepatic tumors and chronic liver disease who were scheduled to undergo hepatectomy. All patients underwent ARFI and MRE prior to surgical resection in the same time. The diagnostic performance of both imaging procedures was compared using METAVIR fibrosis score as the standard of reference. Cut-off values, sensitivities and specificities of both techniques were determined by calculating the areas under the receiver operating characteristic (ROC) curves (AUCs). The study was approved by the institutional review board of our institute.

Results:

Histopathological examination of the resected specimens revealed fibrosis stage F0 in 3 patients, F1 in 8 patients, F2 in 12 patients, F3 in 15 patients, and F4 in 15 patients. Figure 1 shows the relationship between MRE stiffness index and METAVIR fibrosis score; APFI velocity index and METAVIR fibrosis score. Table 1 shows the corresponding cutoff values, sensitivities and specificities of MRE and ARFI for distinguishing different fibrosis stages and table 2 demonstrates the diagnostic performance of MRE and ARFI in differentiating different stages of fibrosis. At a cutoff value of 1.4 m/s, ARFI had a sensitivity of 92.8% and a specificity of 54.5% in differentiating F \geq 2 (significant fibrosis) from F<2. In contrast, at a cutoff value of 2.98 kPa, the sensitivity and specificity of MRE were 87.7% and 100%, respectively. The AUC value for MRE was significantly higher than that of ARFI in differentiating F0-1 from F \geq 2 and F0-2 from F \geq 3 (P<0.05).

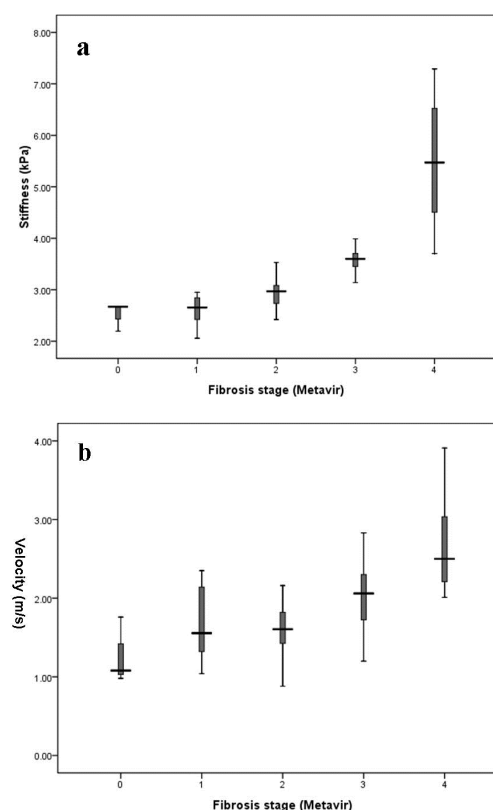


Table 1. AUC, corresponding cutoff value, sensitivity and specificity for distinguishing different fibrosis stages on MRE and ARFI using ROC analysis.

	MRE				ARFI			
	AUC (%)	Cutoff value (kPa)	Sensitivity (%)	Specificity (%)	AUC (%)	Cutoff value (m/s)	Sensitivity (%)	Specificity (%)
F0 vs. F1-4	90.0	2.676	86.0	100	86.0	1.77	64.0	100
F0-1 vs. F2-4	95.0	2.977	87.7	100	76.2	1.40	92.8	54.5
F0-2 vs. F3-4	97.0	3.115	100	91.3	84.9	1.98	80	82.6
F0-3 vs. F4	95.8	3.688	100	86.8	87.9	2	100	68.4

Table 2. The diagnostic performance of MRE and ARFI in differentiation of different fibrosis stages

	MRE			ARFI			MRE vs. ARFI p value
	AUC (%)	95% Confidence Interval	Accuracy (%)	AUC (%)	95% Confidence Interval	Accuracy (%)	
F0 vs. F1-4	90.0	0.786-0.965	86.79	86.0	0.737-0.940	66.04	0.708
F0-1 vs. F2-4	95.0	0.853-0.991	88.68	76.2	0.625-0.868	84.91	0.026
F0-2 vs. F3-4	97.0	0.881-0.997	96.23	84.9	0.723-0.932	81.13	0.017
F0-3 vs. F4	95.8	0.864-0.994	90.57	87.9	0.760-0.952	77.36	0.055

Figure 1. Box-plots illustrating the distribution of MRE stiffness index (a) and ARFI velocity index (b) with stratification by fibrosis stage

Discussion:

According to guidelines published by the American Association for the Study of Liver Diseases (AASLD), treatment of underlying disease should be considered if patients with significant hepatic fibrosis (fibrosis stage \geq 2)². Long-term therapy might result in a regression of fibrosis. Therefore, differentiating between mild fibrosis (fibrosis stage \leq 1) and significant fibrosis is very important to establish an effective treatment strategy. Our results show that MRE had better diagnostic value than ARFI in differentiating mild fibrosis from significant fibrosis.

Conclusion:

MRE provided higher diagnostic performance than ARFI in differentiating significant hepatic fibrosis (stage \geq F2) from mild fibrosis. MRE was recommended in decision of treatment strategy for patient with chronic liver disease.

References:

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