
Shear Wave Elastography Detects Changes in Renal Histopathology

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Objective: The purpose of this study is to investigate the association of kidney stiffness and histopathological findings measured by shear wave elastography (SWE) imaging.

Materials & Methods: 75 patients referred for renal biopsy were included. Using an ultrasound system (Philips EPIQ 7, Bothell, Washington) equipped with SWE software (Philips ElastPQ, Bothell, Washington), Young's modulus (YM) measurement in kilopascal (kPa) from SWE were correlated with histological parameters.

Results: Positive correlation was reported between YM measurements with both tubular interstitial score ($\rho = 0.442$, $p < 0.001$) and glomerular score ($\rho = 0.375$, $p = 0.001$). Patients with no glomerular sclerosis showed lower mean YM measurements compared to groups with $< 10\%$, $10\%–25\%$, $> 25\%–50\%$ and $> 50\%$ of glomerular sclerosis. Mean YM measurements increased as the percentage of interstitial fibrosis and tubular atrophy increased. There was a significant difference between the YM measurement of the $< 25\%$ ($6.13 + 3.42$ kPa) and $25\%–50\%$ ($8.70 + 3.71$ kPa) interstitial fibrosis groups, as well as the $< 25\%$ and $> 50\%$ ($8.93 + 3.36$ kPa) interstitial fibrosis groups. Significant difference was found between YM measurements of the $< 25\%$ ($5.86 + 2.95$ kPa) and $25\%–50\%$ ($8.65 + 3.54$ kPa) tubular atrophy groups as well as the $< 25\%$ and $> 50\%$ ($11.46 + 3.67$ kPa) tubular atrophy groups. The area under the ROC curve for SWE imaging of kidney was 0.702. The cut-off value of ≥ 5.81 kPa indicated moderately impaired kidney.

Conclusion: SWE accurately determine chronic renal damaged resulted in glomerular sclerosis, interstitial fibrosis and tubular atrophy. A cut-off value of ≥ 5.81 kPa suggested a moderately impaired kidney.