QUANTITATIVE RENAL ECHOGENICITY IS COMPARABLE TO HISTOPATHOLOGY IN PREDICTING IRREVERSIBILITY OF IMPAIRED RENAL FUNCTION.

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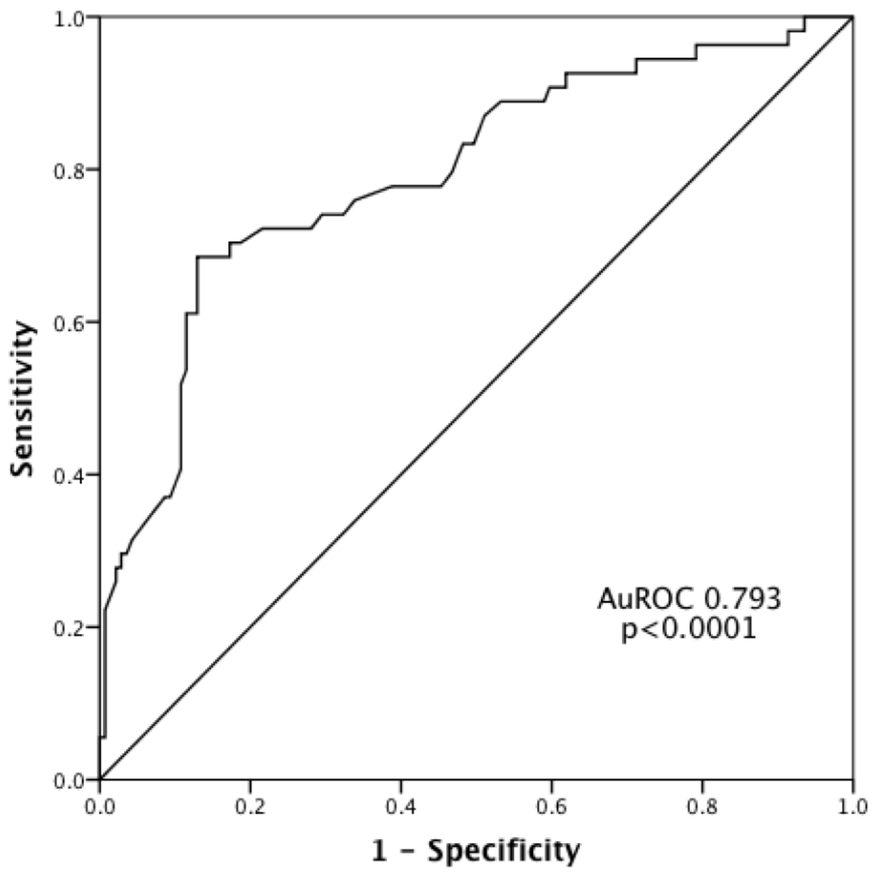
INTRODUCTION AND AIMS

Glomerulopathy patients are prone to developing reversible acute kidney injury (AKI), which can be difficult to differentiate from irreversible chronic kidney disease (CKD). Renal ultrasound can be useful, but differently from renal length, quantitative renal echogenicity has not been formerly evaluated regarding its capacity to identify irreversible advanced CKD.

METHODS

A prospective study was performed, where quantitative renal echogenicity was performed during renal biopsy in patients with suspected suspected glomerular disease (n=197). Quantitative echogenicity was measured as the inverse of the ratio between the mean pixel densities of the renal cortex and adjacent liver using ScionImage software. Patients were followed during a six-months period to ascertain advanced CKD. Quantitative renal echogenicity and histopathology parameters discriminatory capacity were compared regarding their capacity to detect advanced and irreversible CKD - estimated glomerular filtration rate (eGFR) less than 30mL/min/1.73m2 confirmed after a six-month follow-up.

Parameter	AuROC	Sensitivity (%)	Specificity (%)	Predictive positive value (%)	Predictive negative value (%)
Tubular atrophy	0.694 [0.593 – 0.795]	36.8 [21.8 – 54.0]	91.8 [86.0 – 95.9]	56.0 [34.9 – 75.6]	83.9 [77.0 – 89.4]
Interstitial fibrosis	0.783 [0.707 – 0.879]	82.5 [67.2 – 92.6]	70.3 [61.9 – 77.8]	44.6 [33.0 – 56.6]	93.3 [61.9 – 77.8]
Sclerosed glomeruli	0.712 [0.618 – 0.805]	70.4 [54.8 – 83.2]	49.7 [40.7 – 57.9]	30.7 [21.9 – 40.7]	83.9 [74.1 – 91.2]
Inflammatory infiltrate	0.740 [0.640 – 0.839]	39.5 [241 – 56.6]	95.6 [90.4 – 98.3]	71.4 [47.8 – 88.6]	85.0 [98.3 – 90.2]
IF/II index	0.797 [0.718 – 0.876]	84.6 [71.8 – 93.1]	72.7 [64.6 – 79.8]	53.0 [41.7 – 64.0]	92.8 [86.4 – 96.7]
Renal echogenicity	0.793 [0.719 – 0.867]	68.5 [54.4 – 80.5]	85.3 [78.4 – 90.7]	63.8 [50.1 – 76.0]	87.8 [81.1 – 92.7]



RESULTS

From 255 patients, 197 were included in the final analysis. At renal biopsy, the mean eGFR was 53.9±33.6 mL/min/1.73m2 and 63 (32.0%) patients had an eGFR less than 30 mL/min/1.73m2. After the follow-up period, 54 (27.4%) patients were considered as having advanced CKD (eGFR less than 30 mL/min/1.73m2). Mean kidney/liver echogenicity ratio was 1.06±0.29. Renal echogenicity correlated with all histopathological parameters. Renal echogenicity was directly correlated with 24h-proteinuria (r=0.216, p=0.008) and inversely with serum albumin (r=-0.201, p=0.011).Multivariate analysis was performed to calculated a combined histopathology index (HI). Renal echogenicity discriminatory capacity to identify true advanced CKD is shown in figure. Kidney/liver echogenicity ratio greater than 1.15 was the best disciminator. Using this cutoff, 65 (33.0%) patients had elevated renal echogenicity. We compared cortical echogenicity performance against HI index. They had very similar discriminatory capacity - table. When analyzing only patients with eGFR less than 30 mL/min/1.73m2 at the renal biopsy, the positive preditive of high echogenicity was 92.1% [75.6 -98.7]. In the studied population, 33 (16.7%) patients had more than 20% of glomeruli with crescent lesions. In this subpopulation, 11 (33.3%) patients had advanced CKD. Again, renal echogenicity had a good discriminatory capacity to detect advanced CKD - AuROC: 0.872 [0.736 - 1.000] and a PPV of 72.7% - while IF/II index had an AuROC of 0.806 [0.660 - 0.952] and PPV of 50%.

CONCLUSIONS

Quantitative renal echogenicity can be a useful tool in patients with glomerular disease and normal kidney size (>8cm) to identify those patients with irreversible advanced CKD.

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