

COULD DECLINE IN GLOMERULAR FILTRATION RATE AT THE TIME OF KIDNEY BIOPSY PREDICT PROGRESSION OF STEROID-RESISTANT NEPHROTIC SYNDROME IN CHILDREN?

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BACKGROUND AND OBJECTIVE

Steroid-resistant nephrotic syndrome (SRNS) is a one of major causes of chronic renal failure during childhood. The data on the association between decline in estimated glomerular filtration rate (eGFR) at the time of kidney biopsy and clinical outcome of childhood SRNS are limited. The aim of the study was to identify of the value of declined eGFR at the time of kidney biopsy as early predictor of progression of pediatric SRNS to chronic renal failure.

PATIENTS AND METHODS

We conducted a retrospective single-center study of 120 children (52M/68F) with idiopathic SRNS. The mean age at onset of disease was 9.5 (IQR: 5.3; 13.0) years. Histological findings were FSGS in 44.2%, mesangial proliferative glomerulonephritis (GN) in 23.3%, membranoproliferative GN in 15.8%, minimal change disease in 11.7%, membranous nephropathy in 5% patients. The median duration of follow-up was 30.0 (18.0; 48.0) months. SRNS progression was defined as eGFR<60 mL/min/1.73m².

RESULTS

Among 120 children with SRNS 21 (17.5%) had declined eGFR<90 mL/min/1.73m² at the time of kidney biopsy. Patients with eGFR<90 mL/min/1.73m² at the time of kidney biopsy had significantly higher median level of proteinuria: 6.6 (2.4; 14.8) vs. 3.0 (1.2; 6.3) g/m²/d (p=0.017) and less eGFR at the last follow-up: 37.1 (22.7; 80.0) vs. 133.5 (104.1; 150.4) mL/min/1.73m² (p<0.0001) (Fig.1, 2). SRNS children with declined eGFR<90 mL/min/1.73m² at the time of kidney biopsy in comparison with those with stable renal function had a significantly higher frequency of FSGS: 76.2% vs. 37.4% (p=0.002); glomerulosclerosis >20%: 57.1% vs. 18.2% (p=0.0005); tubular atrophy: 38.1% vs. 11.1% (p=0.005); diffuse interstitial fibrosis: 42.9% vs. 15.2% (p=0.013); diffuse effacement of podocyte foot processes (n=74): 80% vs. 34.4% (p=0.012) (Fig.3).

Fig. 1. Proteinuria in SRNS children in relation to eGFR<90 mL/min/1.73m² at the time of kidney biopsy.

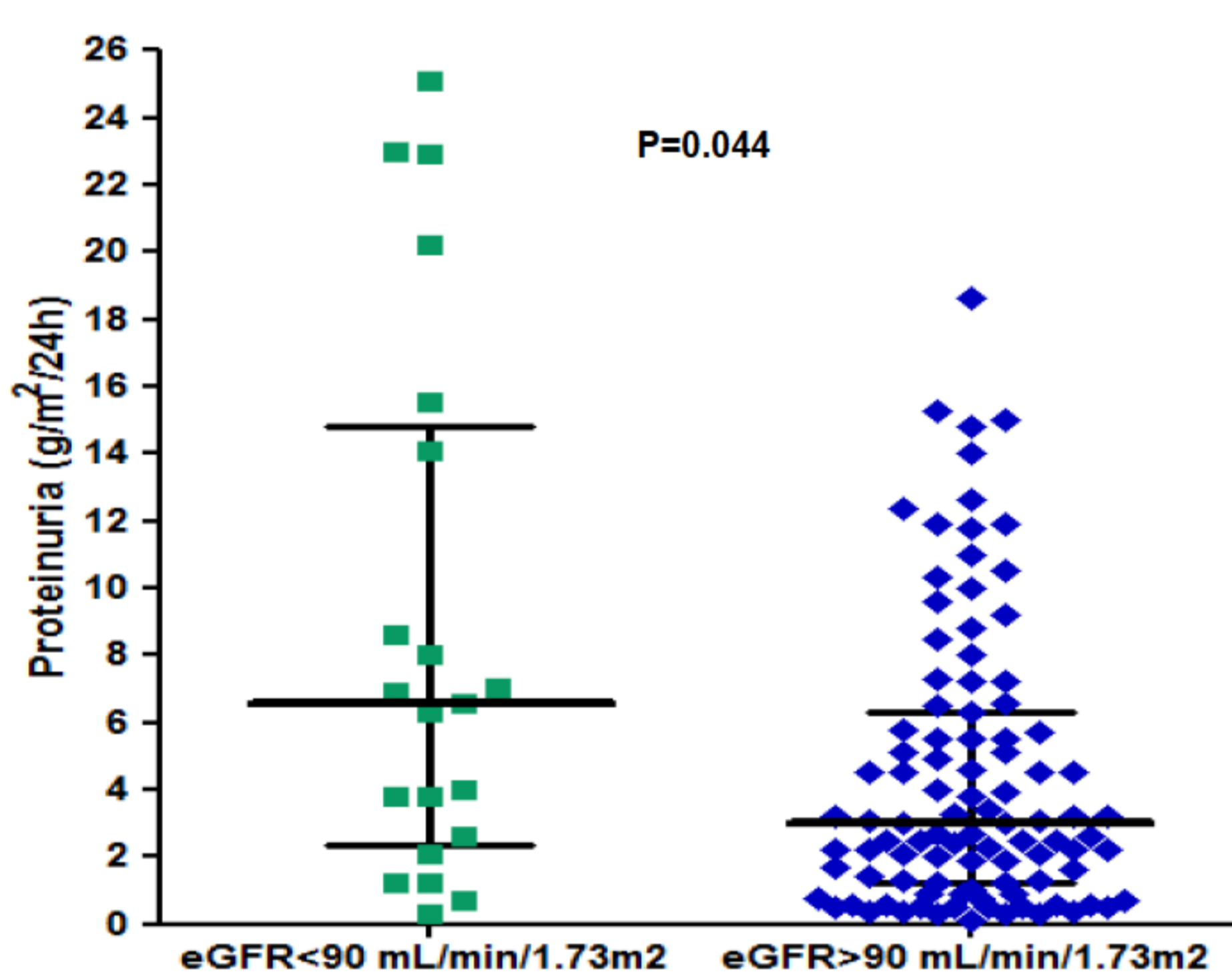


Fig. 2. eGFR at the last follow-up in SRNS children in relation to eGFR<90 mL/min/1.73m² at the time of kidney biopsy.

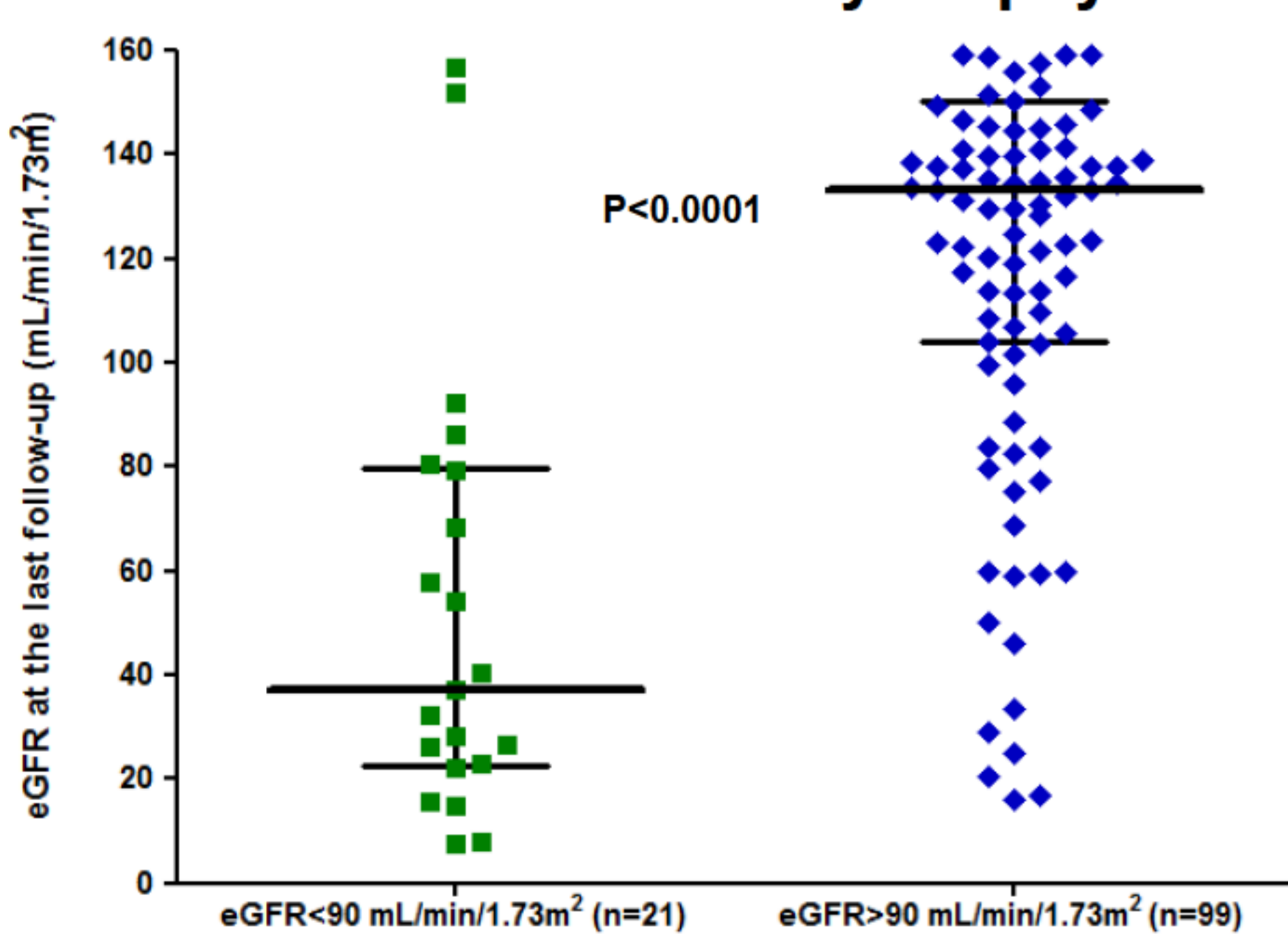


Fig. 3. Renal histological findings in SRNS children in relation to eGFR<90 mL/min/1.73m² at the time of kidney biopsy.

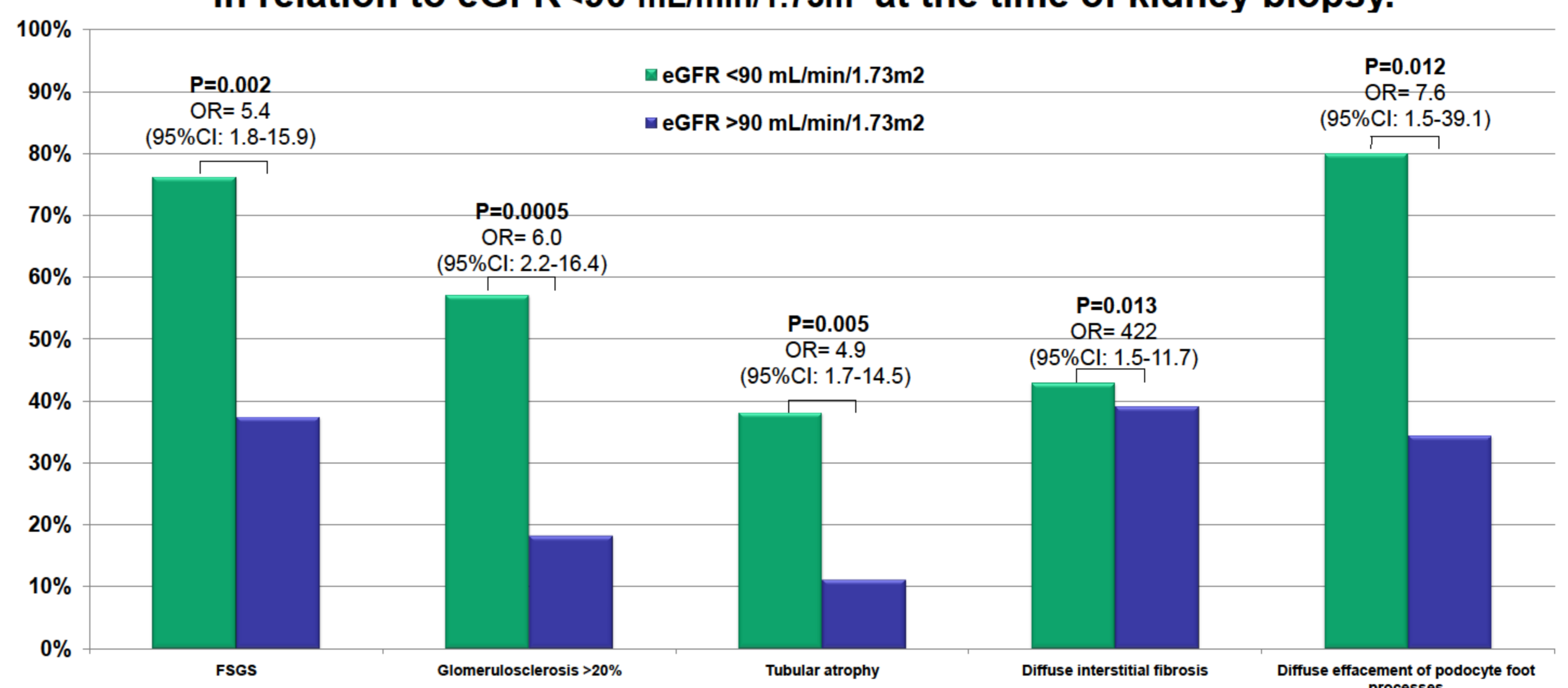


Fig. 4. Kaplan-Meier renal survival curves by eGFR<90 mL/min/1.73m² at the time of kidney biopsy in SRNS children.

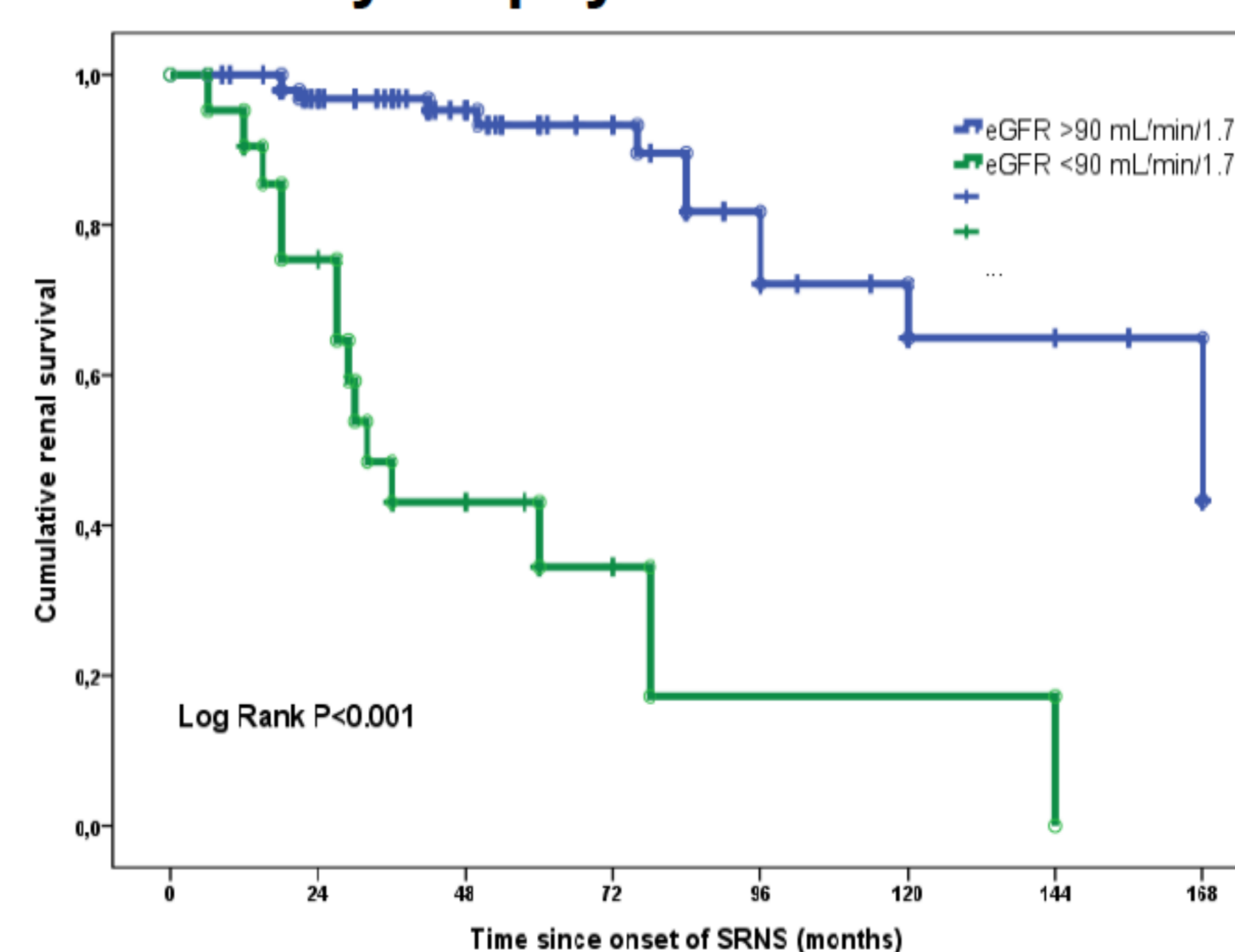
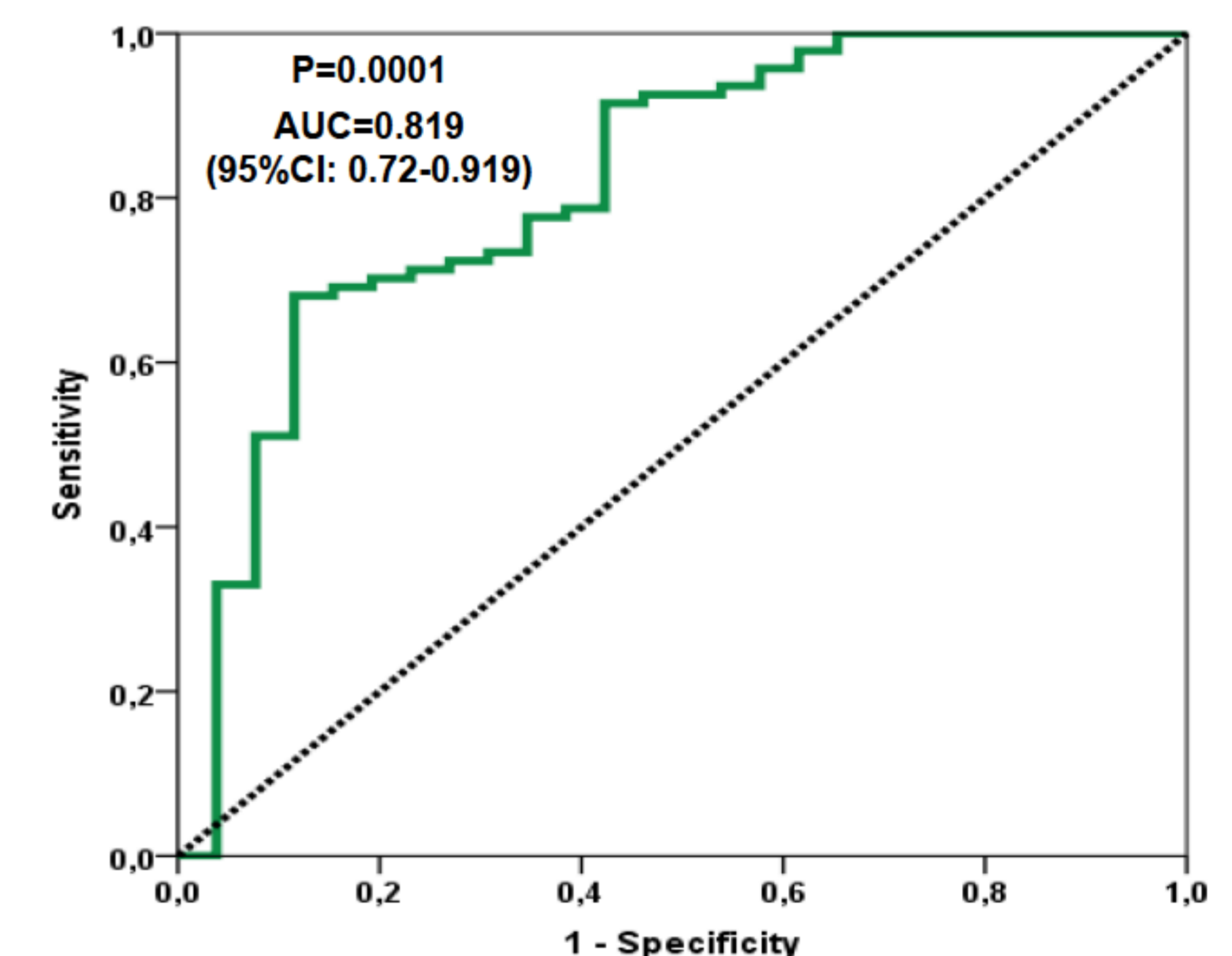


Fig. 5. ROC curve for eGFR<90 mL/min/1.73m² at the time of kidney biopsy as predictor of SRNS progression in children.



The renal survival analysis showed that the group of children with declined eGFR<90 mL/min/1.73m² compared with the stable renal function group had a higher rate of SRNS progression: the 5-year renal survival was 93.1% vs. 58.1%, 10-year - 70.9% vs. 21.8%, respectively (p<0.0001) (Fig.4). The area under the ROC curve (AUC) revealed the significant predictive strength of declined eGFR<90 mL/min/1.73m² at the time of kidney biopsy for adverse outcome of SRNS: AUC=0.819 (95%CI: 0.72-0.918) (p<0.001) (Fig. 5). Univariate Cox regression model showed that decreased eGFR<90 mL/min/1.73m² at the time of kidney biopsy was significant predictor of adverse outcome of pediatric SRNS: HR=10.3 (95%CI: 4.6-23.0), (p<0.0001). Multivariate Cox regression model confirmed that declined eGFR<90 mL/min/1.73m² at the time of kidney biopsy was independent significant predictor of SRNS-to-CRF progression in children: HR=5.5 (95%CI: 1.7-18.2), (p=0.006). Declined eGFR<90 mL/min/1.73m² at the time of kidney biopsy can predict of SRNS progression in children with sensitivity 87.9% (95%CI: 79.8-93.6%), specificity 66.7% (95%CI: 43.0-85.4%), positive predictive value 92.6% (95%CI: 85.3-97.0%), negative predictive value 53.9% (95%CI: 33.4-73.4%), and likelihood ratio 2.6.

CONCLUSION

In children with SRNS declined eGFR<90 mL/min/1.73m² at the time of renal biopsy might be considered as an early independent predictor for the disease progression to CRF. This association can be explained by significant correlations between declined eGFR and FSGS, intensity of glomerulosclerosis, tubular atrophy, interstitial fibrosis, and effacement of podocyte foot processes.

