Association of Urinary Stone Disease with Kidney Function Decline

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Background

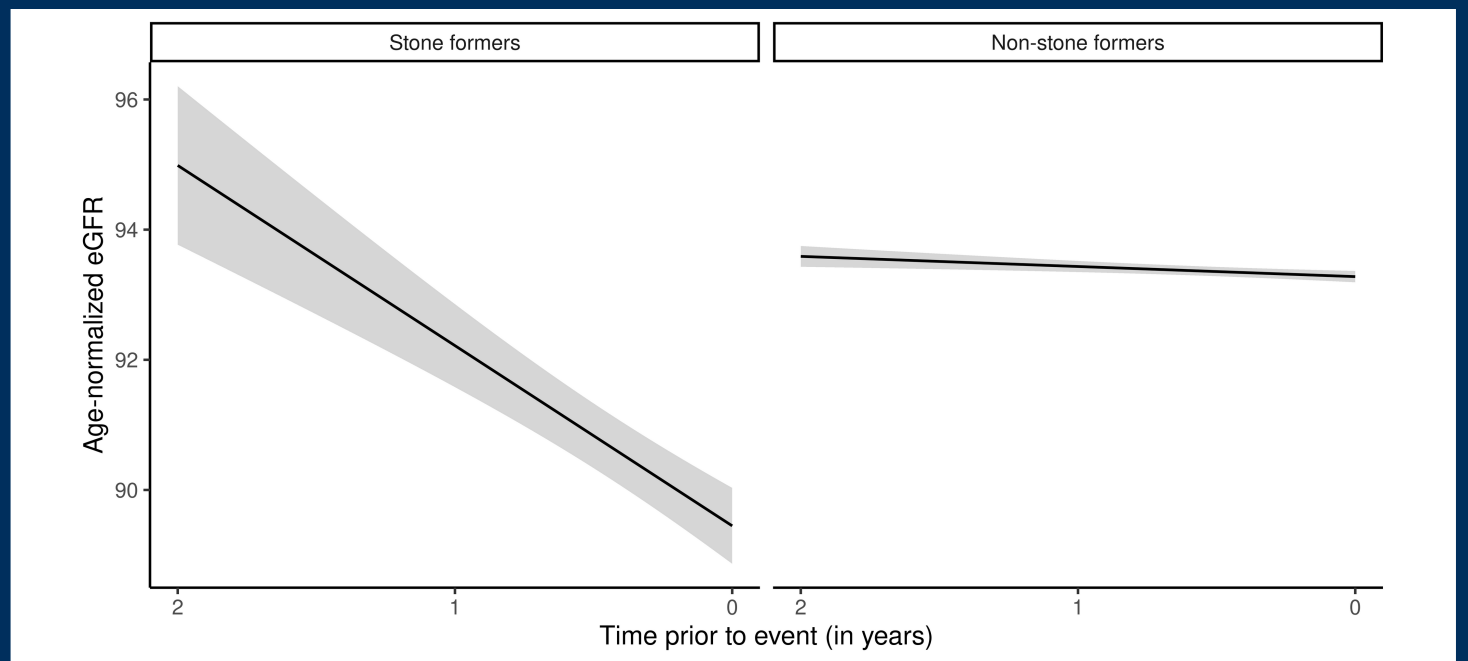
Prior studies have shown significant differences in glomerular filtration rate (GFR) between stone formers and non-stone formers. There is evidence that nephrolithiasis is a risk factor for chronic kidney disease (CKD). The role of kidney function in kidney stone formation however largely remains unexplored. The objective of this study is to investigate differences in kidney function decline between stone formers and non-stone formers over time.

Materials and Methods

A retrospective study was undertaken using de-identified patient data at our tertiary care center. Serum creatinine values of adults (age ≥ 18) were used to calculate GFR using the CKD-EPI creatinine equation. The primary outcome was change in GFR per year using an adjusted linear model. An adjusted cox-model was used to calculate the average risk of stone formation associated with GFR decline in stone formers based on date of initial nephrolithiasis diagnosis. Our secondary outcome was GFR change post stone formation stratified by surgical versus non-surgical intervention.

Results

Stone formers had an overall GFR decline of 2.8 cc/min per year (p-value < 0.001) compared to a decline of 0.04 cc/min per year (p-value = 0.38) in non-stone forming patients. A fully adjusted cox-model indicated, on average, each 1 cc/min decline in GFR was associated with an increased risk of stone development in the following 2 years by 3.7%. Stone formers who underwent surgical intervention (PNL, URS, or SWL) had stable GFR post-operatively at 1 year. Patients who did not undergo surgical intervention had GFR decline of 0.82 cc/min CI [-1.56, -0.08] at 1 year (p-value = 0.03).



Discussion

A decline in GFR is associated with risk of kidney stone presentation up to 2 years prior to a stone event. This suggests that upstream changes in the renal papilla which affect GFR also may be contributing to mineralization. Kidney function decline could be used as a possible predictive tool for risk of stone formation. Additionally, surgical intervention is associated with preservation of GFR within one year after stone event.

Conclusions

Clinically, unexplained GFR decline should increase suspicion for nephrolithiasis and appropriate evaluation and treatment should be considered. Intervention after the acute event ultimately needs to address upstream changes in the renal papilla to help reduce the high recurrence rates seen by patients.