

Chronic stress and calcium oxalate urolithiasis: are the changes in urinary risk factors due to stress *per se*?

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Several studies have reported an association between stress and calcium oxalate (CaOx) urolithiasis by demonstrating differences in urinary lithogenic and anti-lithogenic parameters in patient groups having different stress levels. However, a clear causal relationship has not been established. In order to investigate whether this association might be accounted for by mechanisms involving concentrations of urinary lithogenic factors alone, we retrospectively calculated risk factor quotients using urines which had been collected in a previous study of ours involving 31 first-time (FS) and 33 recurrent (RS) stone formers and 64 matched controls (N) in whom various types of stress had been evaluated. The number and intensity of perceived stressful life events had been found to be greater in RS than in FS. Urinary ratios which we calculated were Ca/Cr, OX/Cr, Mg/Cr, Cit/Cr, urate/Cr, Ca/Cit, Ca/Mg and OX/Cit. Quotients were the CMC index $[(Cit \times Mg)/Ca]$ and the CaOx activity product index $[17.9 (Ca^{0.71} \times OX \times Mg^{-0.14} \times Cit^{0.10})]$. Univariate conditional logistic regression was used to study potential differences in risk quotients between cases and matched controls

Relative to N, FS had significantly lower Cit/Cr values and greater Ca/Mg values. RS had significantly greater values for Ca/Cit, Ca/Mg and a significantly lower CMC value. These results correspond to well-known differences between stone-forming patients and controls. Comparison of FS and RS showed that urate/Cr was significantly higher in the latter group. Other studies have not reported this as a discriminator between the groups, so this finding is noteworthy. There were no other differences between any of the groups in any of the risk ratios or quotients

Differences in urinary risk factors in the present study cannot be attributed to stress *per se*. Like other studies, our results point only to a possible association between cause and effect. Since stress is a process involving biochemical and hormonal alterations, we suggest that these may invoke stone formation mechanisms other than those involving concentrations of routine lithogenic components. The formation of urinary macromolecules such as proteins and glycosaminoglycans, which have been shown to serve as inhibitors and promoters of CaOx stone formation, is an example

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