

Prevention Mechanism of Green Tea on Renal Stone Formation

Introduction and Objective: Renal tubular cell injury induced by oxidative stress is thought to be the initial process of kidney stone formation. There are two major sources of generation for oxidative stress in cells. One is NADPH oxidase and the other is mitochondria. The other is superoxide from mitochondria. Green tea leaves contain approximately 13% catechins, which have been shown to have antioxidant effects. We investigated the inhibitory, antioxidative effects and process of green tea on calcium urinary stone formation.

Materials and Methods: A total of 18 Wistar rats were divided into 3 groups, namely group 1 – control rats receiving saline, group 2 – stone group rats administered ethylene glycol (EG) and vitamin D3, and group 3 – drink group rats administered EG, vitamin D3 and green tea given as drinking water. Pooled 24-hour urine samples and blood samples were collected and the 2 kidneys were excised 7 days after administration. One kidney was used for immunohistological examination of osteopontin, superoxide dismutase (SOD) and detection of apoptosis, while the other was used for quantitative analysis of SOD activity and RT-PCR for p47 phox and Nox-4. Renal tubular cell microstructural damage and crystal nuclei formation were observed using transmission electron microscopy (TEM).

Results: Green tea treatment decreased urinary oxalate excretion and calcium oxalate deposit formation. Green tea treatment increased SOD activity compared with the stone group. The degree of apoptosis in the stone group was significantly increased compared with the drink group. Gene expression of p47 phox and Nox-4 were increased in the stone group. TEM showed the collapsed mitochondria in the renal tubular cells in the stone group.

Conclusions: The inhibitory effect of green tea on calcium oxalate urolithiasis is most likely due to antioxidative effects. There is a possibility that green tea inhibits the oxidative stress generated from NADPH oxidase and superoxide from mitochondria.