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Administration of calcium and vitamin D supplementation in kidney stone formers

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Nephrolithiasis is a common medical issue worldwide and it has an overall prevalence of 7% in women and 10.5% in men (1). It mainly affects active working age population and has high socio-economic burden (2). Calcium comprises about 80%-90% of the kidney stones components as calcium oxalate and calcium phosphate, so that applying measures for reducing urine calcium excretion have increasingly been used (3). Calcium is absorbed by both active calcitriol-dependent and passive mechanisms in small bowel depending on the amount of daily consumption, and it ranges between 10% to 70% (4,5). It has been shown that kidney stone formers have higher fractional absorption of calcium in intestine leading to greater urinary calcium excretion (6,7). Multiple large studies have shown that calcium intake has a protective role against kidney stone formation by decreasing absorption of intestinal oxalate and subsequent decline in urine oxalate (8-10). Furthermore, Restriction of calcium intake not only would raise risk of oxalate absorption, it also has detrimental effect on bone mineral density which has already been lost in kidney stone formers (11). Therefore, moderate calcium intake of 800-1200 mg daily, mainly by calcium-rich diet or as supplementation taking with diet, is advocated for stone formers (12). It has been demonstrated that intake of calcium supplements both with and without meal increases urine calcium, but because of binding of dietary oxalate with calcium when it is taken with meal, the amount of intestinal oxalate absorption and its urine secretion declines and the rate of stone formation would not increase (13). Of note, apart from calcium intake in high amounts, several other dietary habits including low fluid intake, small intake of fruits and vegetable, large sodium intake, excessive consumption of diet rich in oxalate, and high meat intake are involved in stone formation (14). Therefore, patients who are taking calcium and vitamin D supplements should be advised to consider the foregoing predisposing factors of stone formation. Also, as several systemic diseases such as diabetes, obesity and hypertension are linked with stone disease (15,16), approaches for managing these conditions

■ Implication for health policy/practice/research/medical education

Taking recommended doses of supplemental calcium and vitamin D among nephrolithiasis patients have no significant consequence on kidney stone formation.

■ **Keywords:** Vitamin D, Kidney stone, Dietary oxalate

would become relevant.

In two studies, one in postmenopausal women (Women's Health Initiative, WHI) and the other in a groups of older nurses (Nurses' Health Study I, NHS I), which evaluated the consequences of taking supplemental calcium± vitamin D on stone formation, the risk of forming stone was respectively increased 17% and 20% (17,18). Nevertheless, other studies failed to determine an increased risk of stone formation with calcium supplements (8,19). In NHS I study, more than sixty percent of women had taken calcium supplements separate from meals or with a low oxalate breakfast. Of note, urine of active stone former patients who consume calcium± vitamin D should regularly be assessed for hypercalciuria and then dosage and type of supplementation should be adjusted.

There is a large body of evidence regarding the association between vitamin D deficiency and wide spectrum of diseases such as cardiovascular disease and diabetes (20,21). Additionally, Low bone density and vitamin D insufficiency are common in stone formers and they usually need to take vitamin D. It has been presented that serum 25-OH vitamin D level of 20-100 µg/dl has no significant effect on stone formation (22). Conversion of 25-OH vitamin D to 1,25 (OH)₂ vitamin D, which is involved in active intestinal calcium absorption, is tightly regulated by 1-α hydroxylase enzyme and therefore in nontoxic use of vitamin D the likelihood of hypercalciuria is minimal (23). Only WHI study (17) has demonstrated a small increase risk of kidney stones in patients receiving vitamin D together with calcium while studies of male healthcare professionals (Health Professionals Follow Up Study, HPFS) (8) and younger nurses (Nurses' Health Study

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II, NHS II) (19) did not report such a risk with taking usual doses of supplements. Thus, as reported by Akel et al and colleagues in this issue of *Journal of Parathyroid Disease*, taking recommended doses of supplemental calcium and vitamin D among nephrolithiasis patients have no significant consequence on kidney stone formation (24).

Author's contribution

TS is the single author of the paper.

Conflicts of interest

The author declares that she has no conflict of interests.

Ethical considerations

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