The Impact of Dietary Protein on Urinary Oxalate Levels Utilizing the Nutritional Data System for Research (NDSR)

Robert Medairos, MD;[1] Halle Foss, BA;[1] Jack Kleinman, MD;[1] Kristina Penniston, PhD, RD;[2] Andrew Moosreiner, MPH, RD;[1]
Jeffrey Wesson PhD, MD;[1] Carley Davis, MD[1]
[1]Department of Urology, Medical College of Wisconsin, Milwaukee, WI
[2]Department of Urology, University of Wisconsin-Madison, Madison, WI

Introduction

- The impact of dietary protein intake on urinary oxalate has not been clearly delineated. Potential reasons include inaccurate dietary assessment of oxalate, calcium, and vitamin C, as well as lack of control for the amount and source of protein. This study will be the first to use the NDSR to obtain a precise dietary assessment of these factors on self-selected rather than controlled diets.
- The objective of this study is to evaluate the impact of the amount and source of protein intake on urinary oxalate for patients with recent urolithiasis using the NDSR.

Methods

- We prospectively recruited patients from a single institution who either passed or underwent calcium oxalate stone treatment within 6 months and were subsequently referred for a complete metabolic work-up.
- Exclusion criteria: metabolic predispositions to stone formation or taking medications which may impact urine parameters.
- Total dietary intake was obtained using a 3 day food record and 24hr dietary recall.
- A trained bionutritionist analyzed food records with participants using NDSR and conducted a 24hr dietary recall using a multiple pass method.

Methods

- Two 24hr urine collections were conducted after enrollment, one of which was performed the same day as the 24hr food recall. The combined 3 day dietary record with 24hr recall were compared to an average of the two urine samples; the 24hr recall was compared to the same day urine sample.
- Statistical Analysis: linear and multivariable regression analysis were used to determine the effect of the amount and source of protein intake on urinary oxalate, when accounting for dietary calcium, oxalate and vitamin C.

Results

Demographics	
Male	6 (40%)
Female	9 (60%)
Mean Age (Years)	45.1 ± 18.3
BMI	26 ± 6.9

Table 1. Demographics

Linear Regression Analysis	Mean	STDev	Standard Coefficient	R^2	Significance
Total Dietary + 24-Hour Recall					
Total Protein (g)	79.5	22.6	0.50	0.249	0.058
Animal Protein (g)	55.2	20.0	0.33	0.109	0.229
Veg Protein (g)	24.3	9.3	0.50	0.251	0.057
Urinary Oxalate (mg)	32.5	12.0			
24-Hour Recall					
Total Protein (g)	69.5	12.2	0.48	0.234	0.068
Animal Protein (g)	44.8	28.5	0.33	0.112	0.224
Veg Protein (g)	24.7	12.5	0.46	0.21	0.086
Urinary Oxalate (mg)	32.5	31.6			

Table 2. Linear Regression Analysis

Results

Multivariable Regression Analysis	B-Statistic	Significance
24-Hour Recall		
Vitamin C (mg)	-0.057	0.258
Calcium (mg)	-0.008	0.505
Dietary Oxalic Acid (mg)	0.037	0.115
Total Protein (mg)	0.173	0.087
F (4, 10) = 2.54, p = 0.11; R^2 = 0.50		

Table 3. Multivariable Regression Analysis of 24-Hour Recall

Multivariable Regression Analysis	B-Statistic	Significance
Total Dietary + 24-Hour Recall		
Vitamin C (mg)	-0.075	0.15
Calcium (mg)	-0.015	0.086
Dietary Oxalic Acid (mg)	0.061	**0.04**
Total Protein (g)	0.331	**0.03**
F (4,10) = 4.79, p = 0.02; R^2 = 0.66		

Table 4. Multivariable Regression Analysis of Total Dietary + Recall

Conclusions

- The amount of dietary protein was positively associated with urinary oxalate levels after accounting for confounders.
- Total protein as measured in a total dietary assessment with NDSR may hold more predictive value for increased risk of stone formation than a 24hr dietary recall alone.