PARTNER IN KIDNEYCARE
AMGEN®
NEPHROLOGY

Nefrolithiasis

Stijn Konings
Internist-Nefroloog
Catharina Ziekenhuis
Eindhoven

ASN Review 2010
Zeist 20 1 11

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

- Definitie
- Pre test quiz
- Inleiding Pathofysiologie
- Gewijzigde epidemiologie
- Relatie stenen en CKD
- Post test quiz
- Take Home message

PARTNER IN KIDNEYCARE
AMGEN®
NEPHROLOGY

Definitie Nefrolithiasis

Steenvorming in de nier en urinewegen

Urolithiasis: Focus ASN 2010 (Review)

Nefrocalcinosis

Pre test quiz (1)

Waar of niet waar ?

- De incidentie van galstenen en nierstenen zijn aan elkaar gerelateerd
- Ptn. met ca-oxalaat stenen hebben een verhoogd cardiovasculair risico
- Ptn. met behandelde hypertensie hebben een verhoogde kans op het ontwikkelen van nierstenen
- Ptn. die calcium bevattende nierstenen hebben dienen een calcium bepekrt dieet te volgen en oa minder melk te drinken

Pre test quiz (2)

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

Waar of niet waar ?

- Kinderen drinken tegenwoordig gelukkig minder melk, reden waarom de incidentie van nierstenen bij kinderen momenteel daalt
- Ptn. die urinezuurbevattende nierstenen produceren dienen met allopurinol behandeld te worden en hebben daardoor netto uiteindelijk een verlaagd cardiovasculair risico

urolithiasis

80 % Calcium bevattende stenen

- Meeste calcium-oxalaat
- Minder calcium-fosfaat

Overige 20 %

- Urine-zuur
- Struviet (magnesium, ammonium-fosfaat)
- Cystine stenen
- Gemengde stenen
- Medicatie: kristal stenen (Indinavir)

Urolithiasis

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

- Supersaturation (solubility product exceeded) of urine with a crystalloid depends on:
  - Amount of solute ingested and excreted
  - Urine volume
  - Urine pH
  - Promoters
  - Inihibitors

Urolithiasis

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

- Urine is commonly supersaturated with crystalloids
- Observation of individual crystal types in urine does not necessarily mean the patient is at risk for developing urolithiasis

Inhibitors of crystallization and aggregation

- Citrate
- Some cations (e.g. Mg^{+2})
- Glycosaminoglycans
- Nephrocalcin

Balans Steenvorming

PARTNER IN KIDNEYCARE
AMGEN®
NEPHROLOGY

crystal formation → growth → aggregation → adherence to epitheliu

inhibitors

- Citrate
- Magnesium
- Pyrophosphate
- Glycosaminoglycans
- Nephrocalcin
- Osteopontin

- Urinary volume
- Urine flow
- Urine pH

promotors

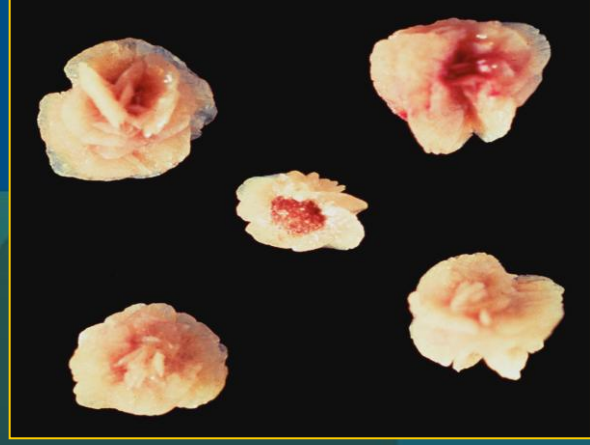
- High solute concentration
- Infection
- Lipids?
- Other macromolecules?

MUSC Children's Hospital

MUSC MEDICAL UNIVERSITY of SOUTH CAROLINA

ayer Presentation Rating

Calcium bevattende stenen



- **Calcium oxalaat:**
- **Risico factoren:**
  - Hypercalciurie met of zonder hypercalciemie
  - Hypocitraturie met of zonder chron. metabole acidose (citraat remt neerslag calcium oxalaat en ook calcium fosfaat)
  - Hyperoxalurie (40 % mannelijke en 15 % vrouwelijke steenvormers), geassocieerd met IBD, malabsorptie, short bowel en prim. Hyperoxalurie
  - Laag urine volume bij weinig intake
  - Prim. hyperpara en wisselend verhoogd calcium
  - Medullaire sponsnier (bij 10 tot 20 % calcium steen vormers, 20 tot 30 % bij vrouwen)
  - (Partiele) Type 1 distale renale acidose: hoge urine pH leidt tot medullaire nephrocalcinose bij verlaagde ammonium prod. in de nier

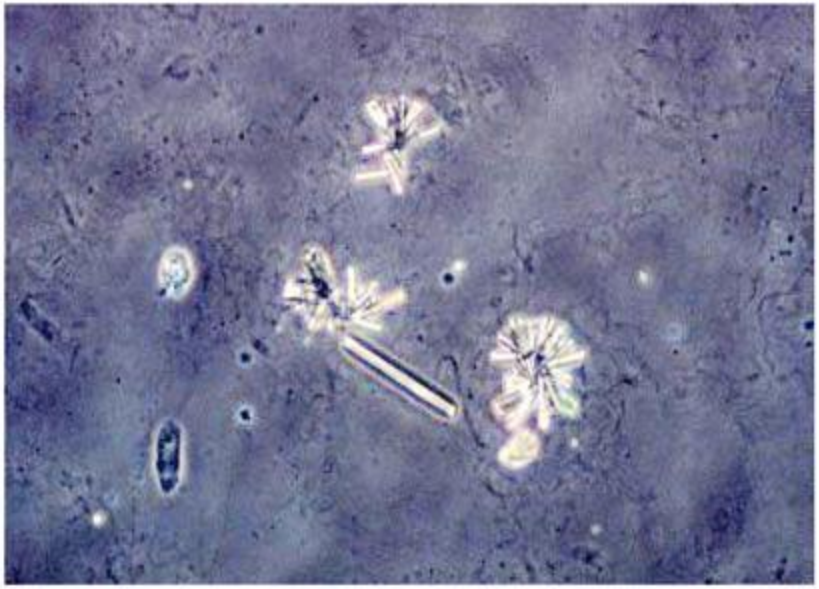
Calcium Oxalate urolithiasis

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

- Composed of calcium oxalate monohydrate (whewellite) or calcium oxalate dihydrate (weddelite)
- Frequently not detected by qualitative analysis

Calcium bevattende stenen

- Calcium fosfaat: risico factoren
  - Meer typisch bij Type 1 RTA
  - Bij prim. hyperpara



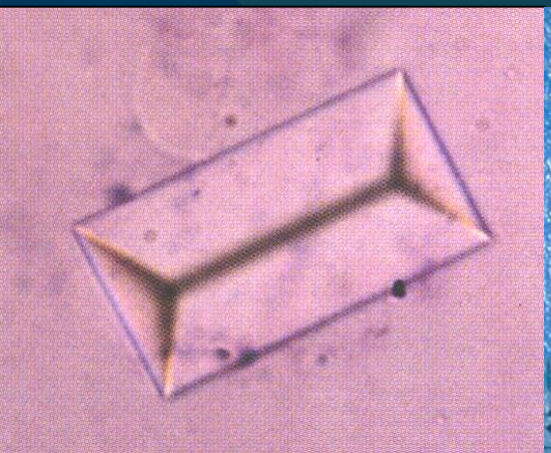
CALCIUM PHOSPHATE (U-pH ≥7.0)

Urine zuur (UZ) stenen

- Pure uz stenen bij pers. met lage urine pH < 5,5
- 3-5 % ptn. met jicht overprod. UZ
- Zonder jicht ook stenen bij chron. overprod. UZ
- Mn. obese personen die meer UZ prod. hebben
- Bij chron. diarrhee bic. verlies en volume depletie: geconcentreerde zure urine

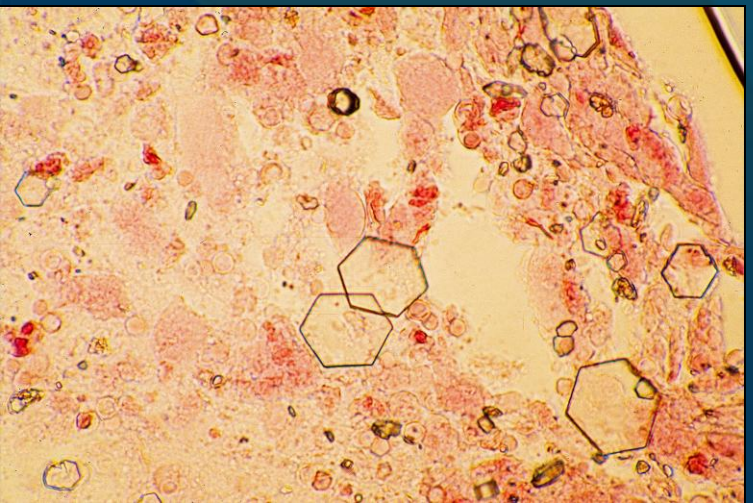
Struviet Stenen

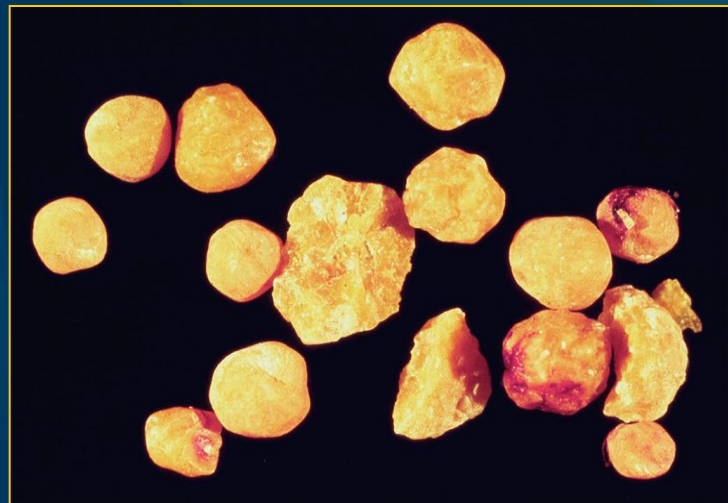
- Ptn. met crhon. hoge UWI's door urease prod. micro-organismen zoals:
  - Proteus en Klebsiella
  - Meerdere Mg++ Nh4+ crystallen id urine
  - Stenen kunnen snel groeien (wkn, mndn): Afgietselsteen, koraalsteen



Cystine stenen

- Bij ptn. met cystinurie,
- Autosomaal recessieve ziekte
- 25 % pathognomische hexagonale cystine kristallen in de urine
- Cystine conc. Urine > 250 mg/l





Risico factoren steenvorming

- Laag volume intake
- Dieet met hoog gehalte dierlijk eiwit
  - Leidt tot hypercalciurie, hypocitraturie, hyperuricosurie en verhoogde uitscheiding zuur id urine om metabole acidose te bestrijden (lage urine pH)
- Dieet met hoge zoutintake, leidt tot hoge Na (en wsch. ook Ca) uitscheiding in de urine
- Dieet met hoge intake oxaalzuur (spinazie, noten en pinda's)

- Dieet met weinig intake calcium: toename absorptie oxaalzuur door minder complex vorming id TD, uiteindelijk netto negatief resultaat op steenvorming
- Hoge fructose intake: purinezuur metabolisme leidt tot urinezuur vorming

- Bepaalde medicatie: indinavir, triamtereen, sulfadiazine (kristalvorming)

Recurrence rate

- Ca++ stenen:
  - Mannen:
    - 15 % 1e jaar
    - 35 a 40 % na 5 jaar
    - 50 % na 10 jaar
  - Vrouwen iets minder
  - Overall 5 % per jaar 1 e 5 jaar

Work up

- Limited evaluation
- Complete evaluation
  - Meerder malen urine verzamelen: grotere kans sign. afw. te vinden
- Targetted approach
  - Blanke mannen middelbare leeftijd met pos. fam. anamnese
  - Ptn met chron. diarrhee en malabs., uwi's, jicht
  - Ptn met calciumfosfaatstenen, cystine, uz of struviet stenen

Gewijzigde epidemiologie

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

Epidemiological Trends in Pediatric Urolithiasis at United States Freestanding Pediatric Hospitals

Jonathan C. Routh, Dionne A. Graham, Caleb P. Nelson

Received 27 December 2009 published online 21 July 2010.

Abstract | Full Text | PDF | Images | References

Purpose

Anecdotal and lay press reports suggest that the incidence of pediatric urolithiasis is increasing but reliable data are lackin
The objective of this study was to examine trends in the epidemiology of urolithiasis at pediatric hospitals nationwide.

Materials and Methods

The Pediatric Health Information System database is a national database covering 42 freestanding United States pediatric hospitals that captures inpatient admissions, and emergency department and outpatient surgery visits. We searched the Pediatric Health Information System database to identify children (18 years old or younger) treated for urolithiasis between 1999 and 2008. Patients with urolithiasis were measured as a proportion of the total number of patients seen per hospital annually. Trends were verified by comparing results to 2 other common pediatric diagnoses—appendicitis and viral bronchiolitis.

Results

We identified 7,921 children diagnosed with urolithiasis during the study period. The total number of children with urolithiasis seen in Pediatric Health Information System hospitals increased from 125 in 1999 to 1,389 in 2008. Mean number of stone cases per hospital per year increased from 13.9 to 32.6. Compared to total hospital patients, the proportio of patients with pediatric urolithiasis increased from 18.4 per 100,000 in 1999 to 57.0 per 100,000 in 2008, an adjusted annual increase of 10.6% ($p < 0.0001$). Urolithiasis also increased compared to appendicitis ($p < 0.0001$) and bronchiolitis (< 0.0001).

Conclusions

Even after correcting for increases in total patient volume at Pediatric Health Information System hospitals, there has been a significant increase in the number of children diagnosed with and treated for urolithiasis at these hospitals in the last decade.

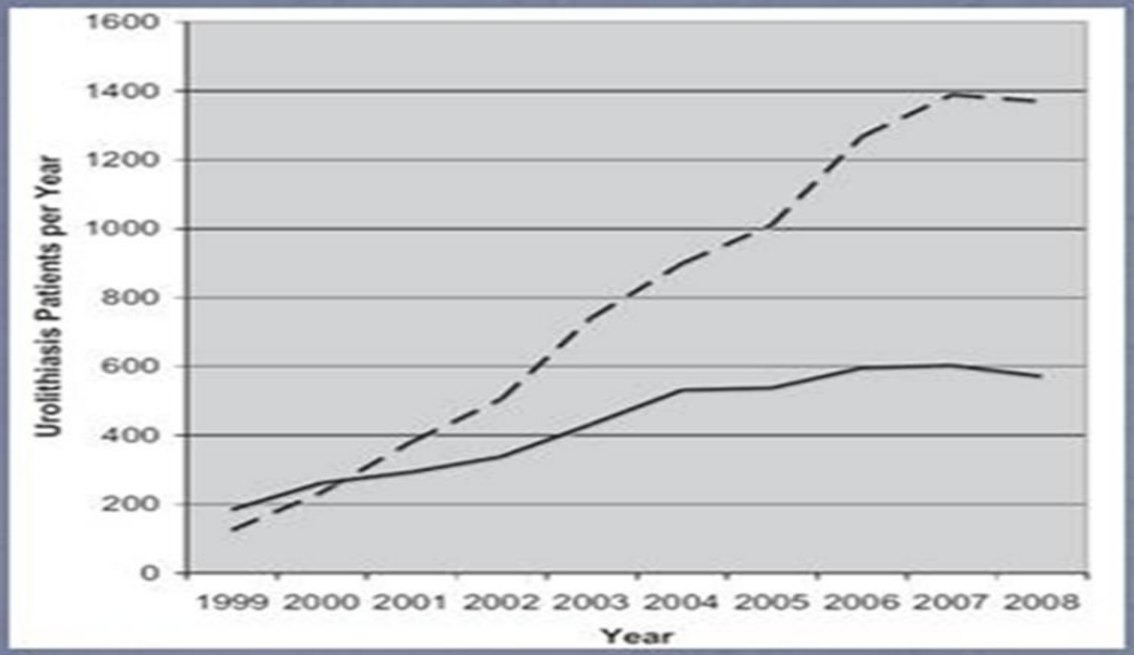
Key Words: epidemiology, nephrolithiasis, pediatrics, urolithiasis

Abbreviations and Acronyms: ICD-9-CM, International Classification of Diseases, 9th revision, clinical modification, KID, Kids' Inpatient Database, PHIS, Pediatric Health Information System

Toename Urolithiasis bij Kinderen

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

Pediatric nephrolithiasis patients in U.S. Children's Hospitals



Broken line – unadjusted

Solid line – adjusted for hospital volume

Routh et al. *J Urol* 2010

Gewijzigde epidemiologie

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

NATIONWIDE CHILDREN'S HOSPITAL™

The Increasing Burden of Pediatric Urolithiasis in the United States

John David Spencer, Halima Janjua, John D. Mahan, Andrew Schwaderer

Center for Clinical and Translational Research
The Research Institute at
Nationwide Children's Hospital
Columbus, Ohio

Department of Pediatrics
Division of Nephrology
College of Medicine
The Ohio State University

ABSTRACT

Background: Recent evidence suggests that the prevalence of urolithiasis is increasing in the USA. The epidemiology of pediatric urolithiasis is not well characterized. A recent NIH report identified pediatric urolithiasis as an insufficiently researched area.
Objective: To evaluate the demographics of pediatric urolithiasis admissions and identify trends in their utilization of healthcare resources.
Design/Methods: A retrospective analysis was performed on children ≤18 yrs of age, admitted with urolithiasis from 1997-2006, using the Healthcare Cost & Utilization Project Kids' Inpatient Database.
Results: *Hospitalizations*: From 1997-2006, the KID captured 6.5 million annual discharges. During this period, 3,799 ± 152 children/yr were hospitalized with urolithiasis. Hospitalizations increased 30% (p<0.001); female admissions increased 36% and male admissions increased 27% (p<0.001). The average hospitalization was 2.2 +/- 0.1 days and did not vary by year, gender, or age group. *Patient Demographics*: Females were 1.5 times more likely to be admitted than males. Children ≤10 yrs of age were more likely to be hospitalized if they were male; patients ≥15 yrs of age were more likely to be hospitalized if they were female (p < 0.001). Children with ureteral calculi were 1.5 times more likely to be admitted than children with renal calculi. *Geographic Location*: Hospitalization rates in the South were 1.7 times more common than hospitalization rates in the Midwest and 2.5 times more common than in the Northeast or West. *Hospital Economics*: In 2000, estimated hospital costs for a urolithiasis admission were $3,384/hospitalization. In 2006, costs rose to $5,115/hospitalization. Mean hospital charges increased from $5,927 to $9,868 per hospitalization – representing a 66% increase.
Conclusions: Urolithiasis is common in the American pediatric population. Since 1997, hospitalization rates for urolithiasis rapidly increased. Hospitalization is more common in females, teens, and children from Southern states. Although lengths of hospitalization remain constant, hospital charges continue to rise.

BACKGROUND

The epidemiology of pediatric urolithiasis is not well characterized.

Recent evidence suggests that the prevalence of urolithiasis is increasing in the United States.

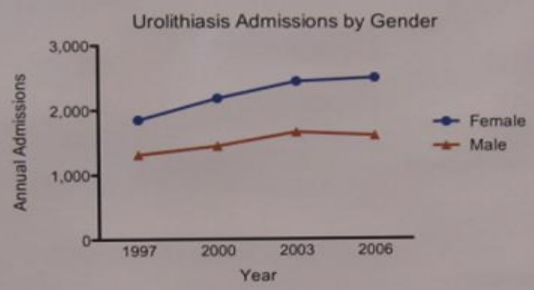
The NIH identified pediatric urolithiasis as an insufficiently researched area.

METHODS

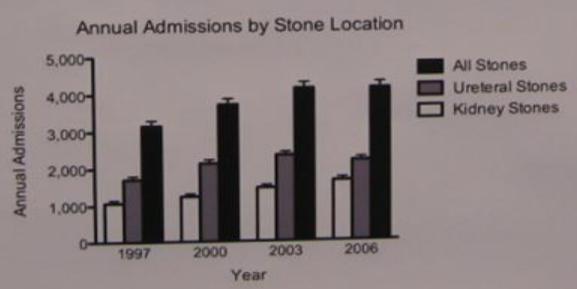
A retrospective analysis was performed on children ≤18 yrs of age, admitted with urolithiasis from 1997-2006, using the Healthcare Cost and Utilization Project Kids' Inpatient Database (KID).

RESULTS

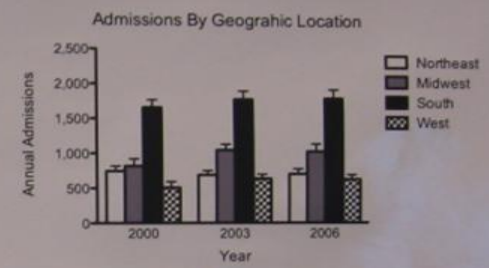
Hospitalizations: From 1997-2006, 3,799 ± 152 children/yr were hospitalized with urolithiasis. During this period, hospitalizations increased 30% (p<0.001)



Patient Demographics: Children with ureteral calculi were 1.5 times more likely to be admitted than children with renal calculi.



Geographic Location: Hospitalization rates in the South were more common than hospitalization rates in the Midwest, Northeast, or West.



Hospital Economics: Since 2000, mean hospital charges increased from $5,927 to $9,868 per hospitalization.

Conclusion

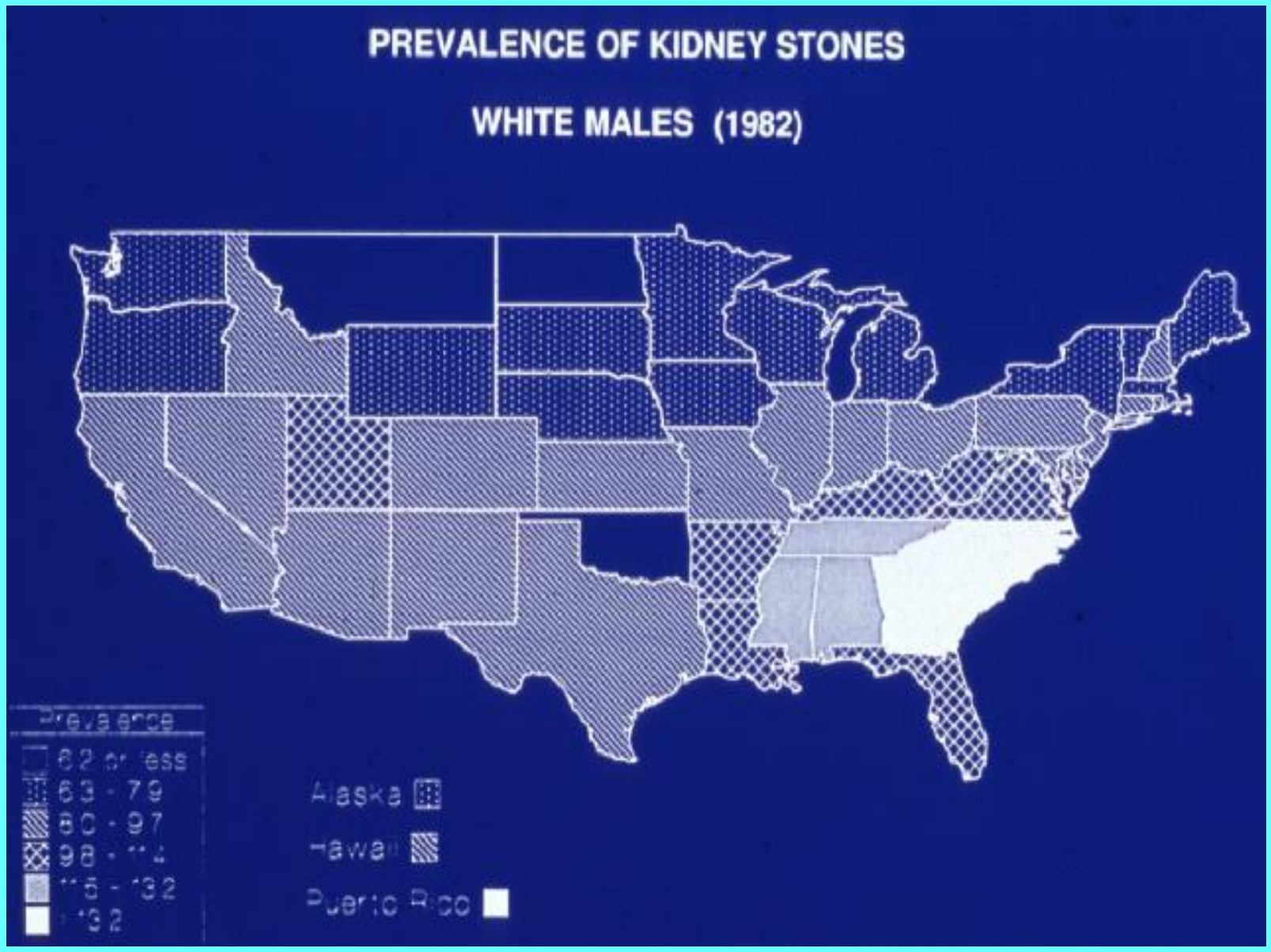
Urolithiasis is common in the American pediatric population.

Hospitalization rates for urolithasis have rapidly increased.

Hospitalization is more common in females, teens, and children from Southern states.

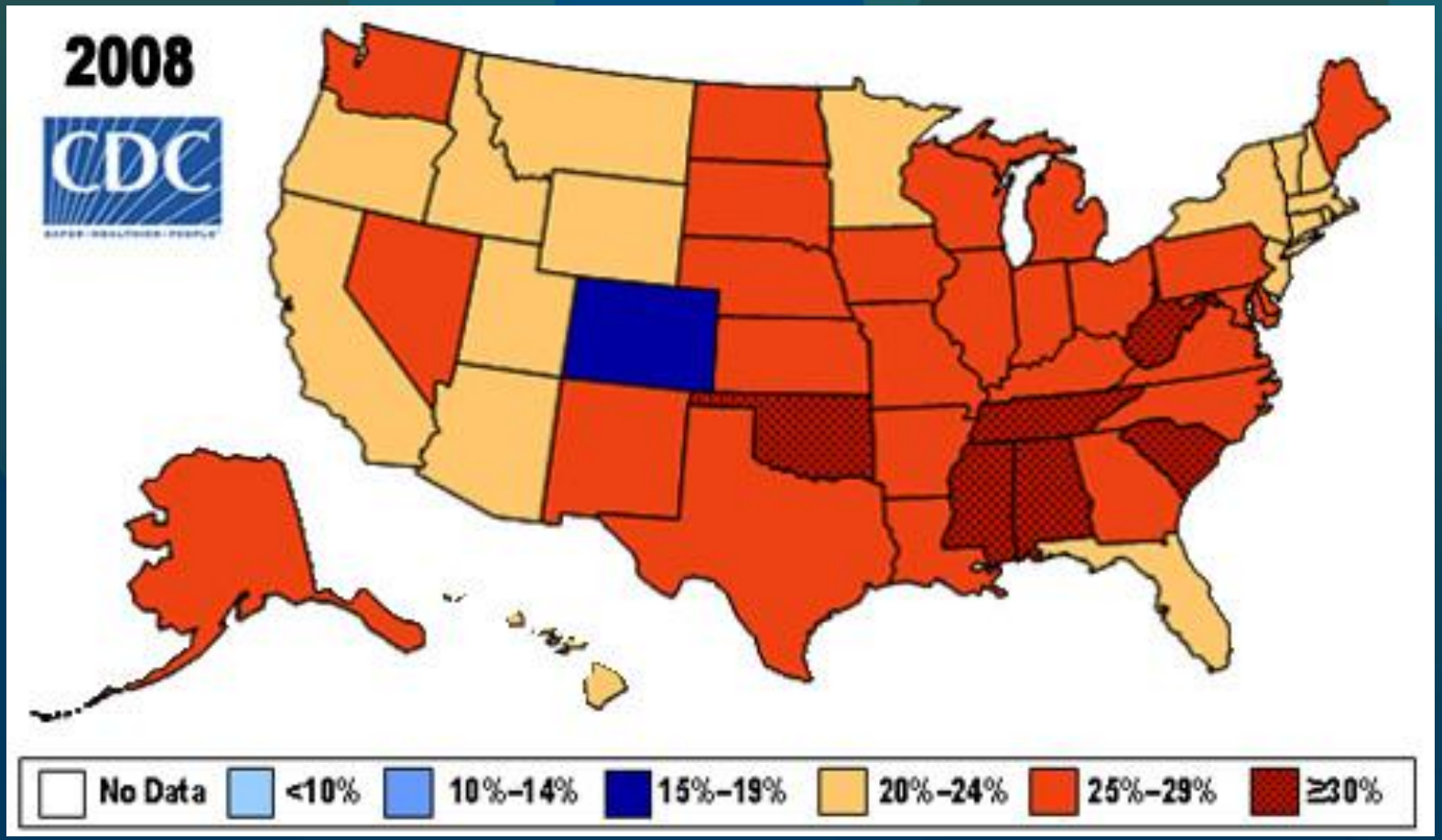
Hospital charges for urolithiasis have rapidly increased.

HISTORIC USA STONE BELT



Actuele Stone Belt met een Hoedje

Overlap Obesitas & Stone Belt



Gewijzigde epidemiologie

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

NierNieuws

video webshop rubrieken recepten onde

Steeds meer nierstenen bij kinderen VS

Amerikaanse onderzoekers van de universiteit van Harvard hebben in een onderzoek aangetoond dat het aantal kinderen met niersteenlijden drastisch is verhoogd.

De onderzoekers hebben voor hun onderzoek gegevens uit 42 ziekenhuizen gebruikt en hebben over een periode van negen jaar, van 1999 tot 2008, gekeken naar het voorkomen van urolithiasis (niersteenvorming) bij kinderen tot 18 jaar. In totaal werden in de onderzochte periode 7.192 kinderen gediagnosticeerd met nierstenen in de 42 participerende ziekenhuizen.

Lees ook:
29-10-2008
Kinderen hebben steeds vaker nierstenen door te zout eten

In 1999 kregen 125 kinderen de diagnose urolithiasis. Negen jaar later waren dat er maar liefst 1.389. Het is waar dat er in 1999 nog maar 9 ziekenhuizen data aanleverden voor de PHIS (Pediatric Health Information System)-database en in 2008 waren dat er 42. Maar na een statistische correctie was er nog steeds een significante toename van het aantal kinderen met nierstenen.

Deze stijging is in een paar eerdere studies gesuggereerd, gezien de verhoogde inname van veel en ongezonde voedsel door de kinderen in de Verenigde Staten, maar het is nooit bewezen met een goed en duidelijk onderzoek. Een ander factor die ook te maken heeft met deze stijging, is het feit dat er ook meer aandacht voor is in de zin van dat er meer kinderurologen zijn, meer verwijzingen en meer technische mogelijkheden.

Een interessant fenomeen en volledig in contrast met de kinderen in de VS, is het feit dat uit een Japans onderzoek is gebleken dat er tussen 1965 en 2008 geen significante stijging te zien was in de incidentie van kinderen met nierstenen in dat land.

Gepubliceerd: *dinsdag 04-01-2011* Bron: *Journal of Urology*

Reageer op dit artikel ★★★★★

Oorzaak Toename

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

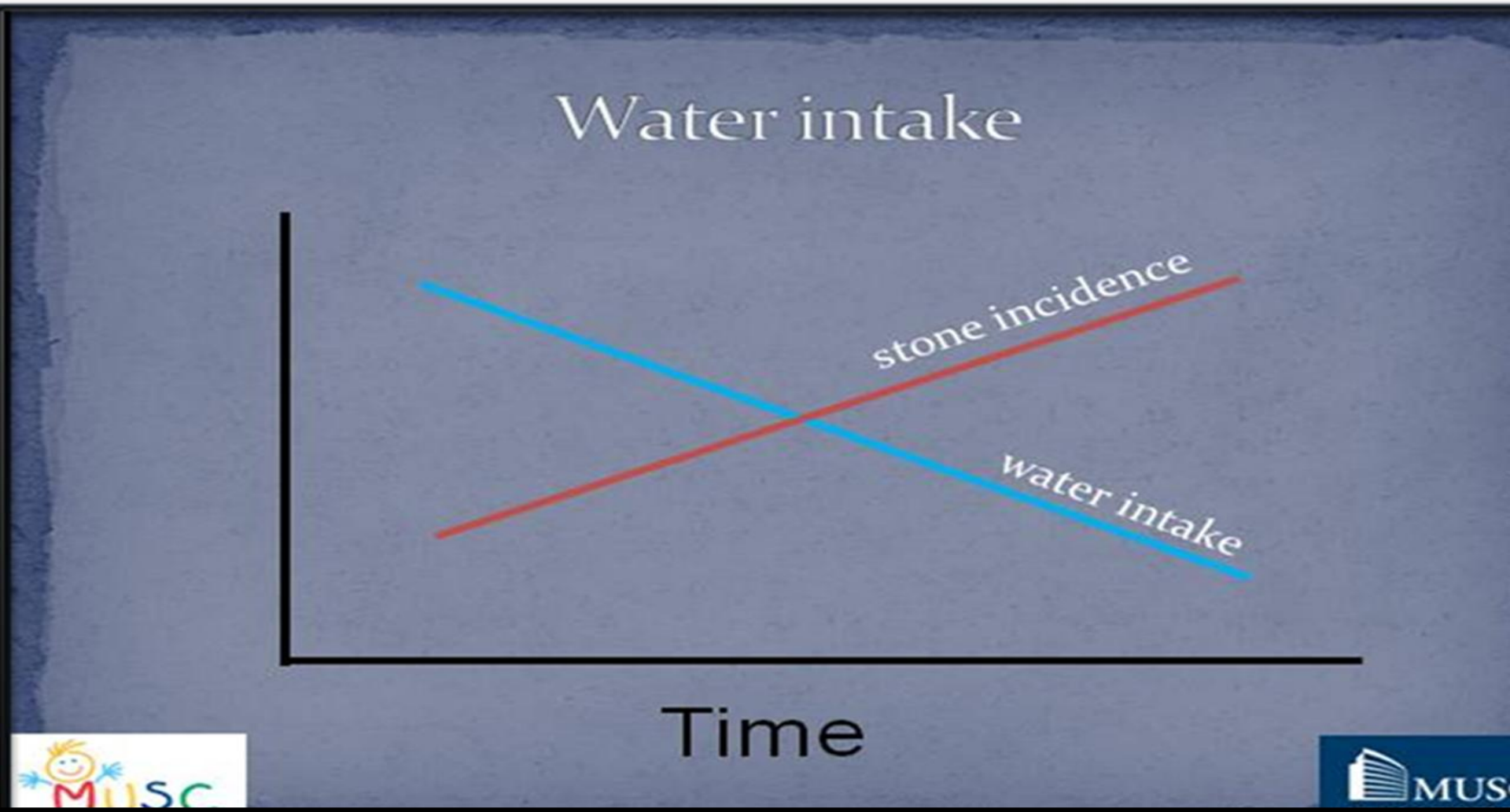
Why the increase?

	Is this actually occurring?	Any science to support this as a mechanism?
Obesity	👍	👎 ?
Decreased water intake	👍	👍
Decreased calcium intake	👍	👍
Increased salt intake	👎 ?	👍
Increased fructose intake	👍	👎 ?
Increased antibiotic use	👎	👎 ?

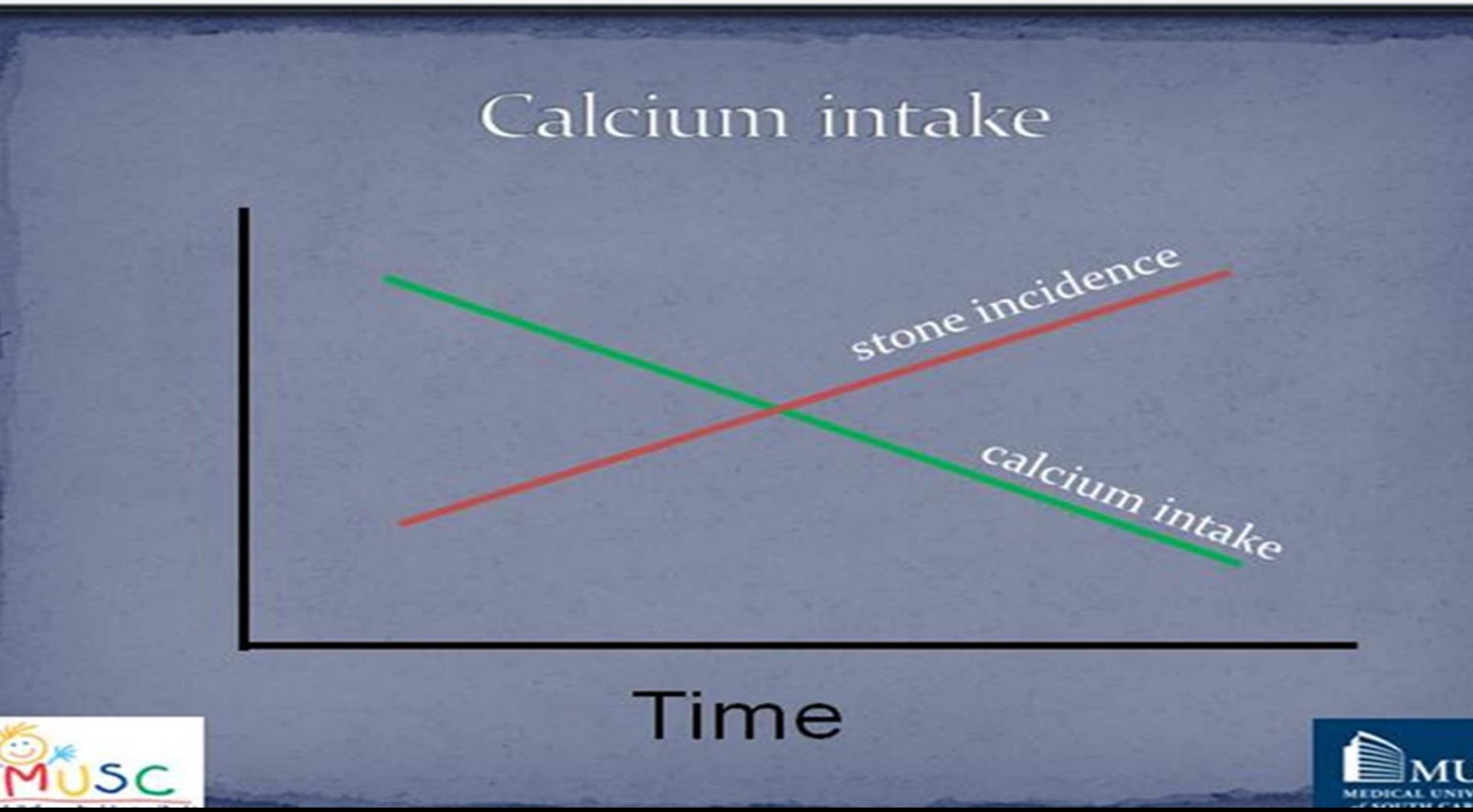
MUSC Children's Hospital

MUSC MEDICAL UNIVERSITY of SOUTH CAROLINA

Relatie H2O intake



Relatie Calcium intake



- **Cola is slecht voor de nieren**
-
- Het drinken van twee glazen cola per dag geeft twee keer zoveel kans op nierinsufficiëntie (onvoldoende nierwerking). De gevaren van cola liggen dus niet alleen in het hoge suikergehalte, maar ook in de hoeveelheid fosforzuur die het bevat. Cola wordt nog altijd door heel veel mensen gedronken, ondanks de vele kritiek die er op bestaat. **De meest geleverde kritiek betreft het hoge suikergehalte in cola,** dat gewichtstoename en diabetes bevordert.

- **Cola en fosforzuur**
- Er is dus nog een ander gevaar, namelijk het fosforzuur dat in cola zit en de drank zijn zurige smaak geeft. Bij de andere soorten frisdranken maakt men daarvoor gebruik van citroenzuur. Een hoge hoeveelheid fosforzuur zou de werking van de nieren aantasten en het ontstaan van nierstenen bevorderen. Om dit fenomeen te illustreren hebben Amerikaanse onderzoekers 500 mensen gezocht bij wie recent nierinsufficiëntie was ontdekt. Er werd gevraagd naar hun eetgewoonten en hun drankgebruik. Deze gegevens werden vervolgens vergeleken met die van een controlegroep. De onderzoekers stelden vast dat het risico op nierinsufficiëntie vanaf twee glazen cola verdubbelt, iets wat overigens ook geldt voor cola light. Bij de andere frisdranken werd geen enkele aanwijzing gevonden, wat het vermoeden versterkt dat de klachten wel degelijk worden veroorzaakt door fosforzuur.
- **Nierinsufficiëntie en fosforzuur**
- Nierinsufficiëntie is een ziekte die veel voorkomt. Tienduizenden Nederlanders zouden deze ziekte hebben, sommigen zelfs zonder het te weten. De aandoening is moeilijk vroegtijdig op te sporen, omdat ze erg verraderlijk is. Ze ontwikkelt zich sluipend en onopgemerkt gedurende vele jaren, tot er een onomkeerbare nierinsufficiëntie optreedt. Het is dus belangrijk om je te laten onderzoeken (een simpele bloed- en/of urinetest) als je veel cola drinkt.
- **Cola bij nieraandoeningen**
- Nu al wordt aan mensen met een nierziekte aangeraden om geen cola en andere levensmiddelen die fosforzuur bevatten, zoals vlees, te eten of drinken. Maar het kan zeker nuttig zijn om deze raadgeving uit te breiden naar andere doelgroepen. In afwachting van de resultaten van andere onderzoeken, zouden mensen met een risico op een nierziekte er goed aan doen om voorzichtig te zijn met cola en het zeker niet elke dag te drinken. In het algemeen zou iedereen die elke dag cola drinkt, met zijn huisarts moeten overleggen of er reden is voor een onderzoek naar nierinsufficiëntie.
- **Aantal calorieën in cola**
- Coca-Cola bevat 42 kilocalorieën (175,6 kJ) per 100 mL. Dat is ongeveer 95 kcal voor een groot glas (225 mL) en 63 kcal voor een klein glas (150 mL). Per 100 mL bevat Coca-Cola 10,6 g suiker.
- Coca-Cola Light bevat 0,2 kcal per 100 mL.
- **200ml coca cola bevat 40 mg fosfaat**
- .

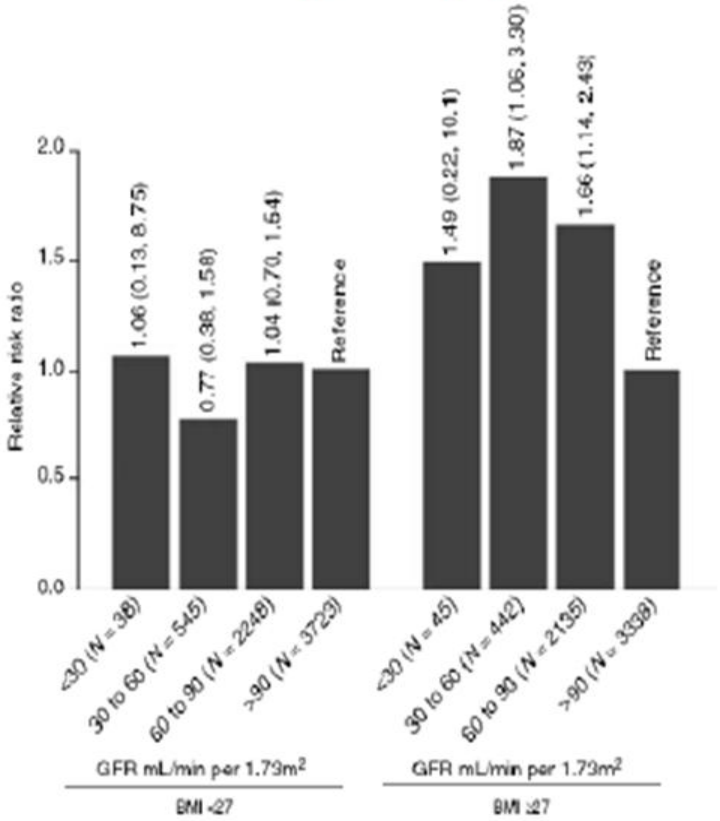
Associatie ook bij volwassenen NHANES III:

BMI > 27 groter risico steenvorming

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

eGFR lower for stone formers in the general population with BMI>27

- NHANES III sample
- 5.7% stone formers
- Adjusted for age, sex, race, BP, diuretics
- For BMI >27: eGFR lower in stone formers (-3.4 ml/min/1.73 m²) (p=0.005)
- For BMI <27: No difference (p=0.29)



Gillen DL et al, Kidney Int, 2005

MAYO CLINIC

Cohort Thailand

Verhoogd risico steenvorming bij CKD

Increased risk of kidney stone history in incident CKD patients compared to community controls

- Cases: Newly diagnosed CKD by ICD9 codes and confirmed by two or more elevated SCr levels >1.5 mg/dl (n=548).
- Controls: Random digit dialing and Medicare recipient listings frequency matched to cases on age, sex, race, location (n=514).
- History of nephrolithiasis by chart review in cases and by interview in controls.
- CKD risk was predominantly interstitial nephritis (pyelonephritis)

	N cases (% stones)	OR	(95% CI)
Chronic renal disease (all)	548 (16.8)	1.9	(1.1, 3.4)
Nephrosclerosis	104 (12.5)	1.1	(0.4, 3.0)
Diabetic nephropathy	108 (14.8)	2.5	(0.9, 7.0)
Glomerulonephritis	76 (11.8)	0.8	(0.3, 2.5)
Interstitial nephritis	106 (27.4)	3.4	(1.5, 7.4)
ESRD	36 (13.9)	1.5	(0.3, 8.8)
Renal insufficiency	118 (17.0)	1.1	(0.4, 2.9)

Non-HTN OR=3.0 (1.3,6.8)

HTN OR=1.0 (0.4,2.4)

(Effect HCT gebr.)

Vupputuri S et al, AEP, 2004

MAYO CLINIC

Cohort Thailand

Nierstenen als risicofactor voor CKD

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

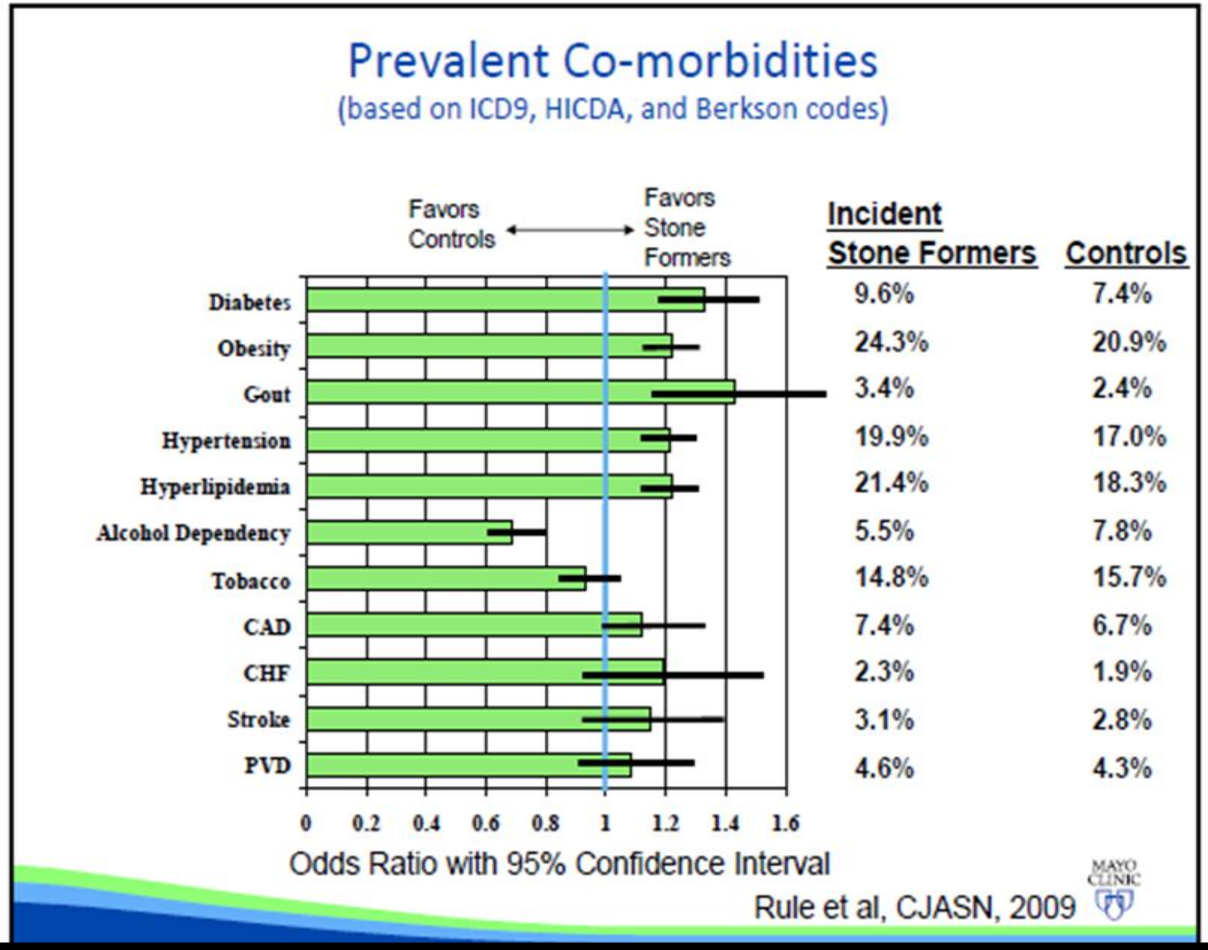
Population-based studies of kidney stones as risk factors for CKD

- Risk factor for CKD in Thailand
- 3459 subjects surveyed with concurrent eGFR and UACR measures
- 5% reported a history of kidney stones
- 18% had CKD (eGFR<60 or UACR>30 **or RBC >5/HPF**)
- Multivariable adjusted OR = 2.7 (95% CI: 1.6 to 4.7)
- Adjusted for age, sex, diabetes, hypertension, & serum uric acid

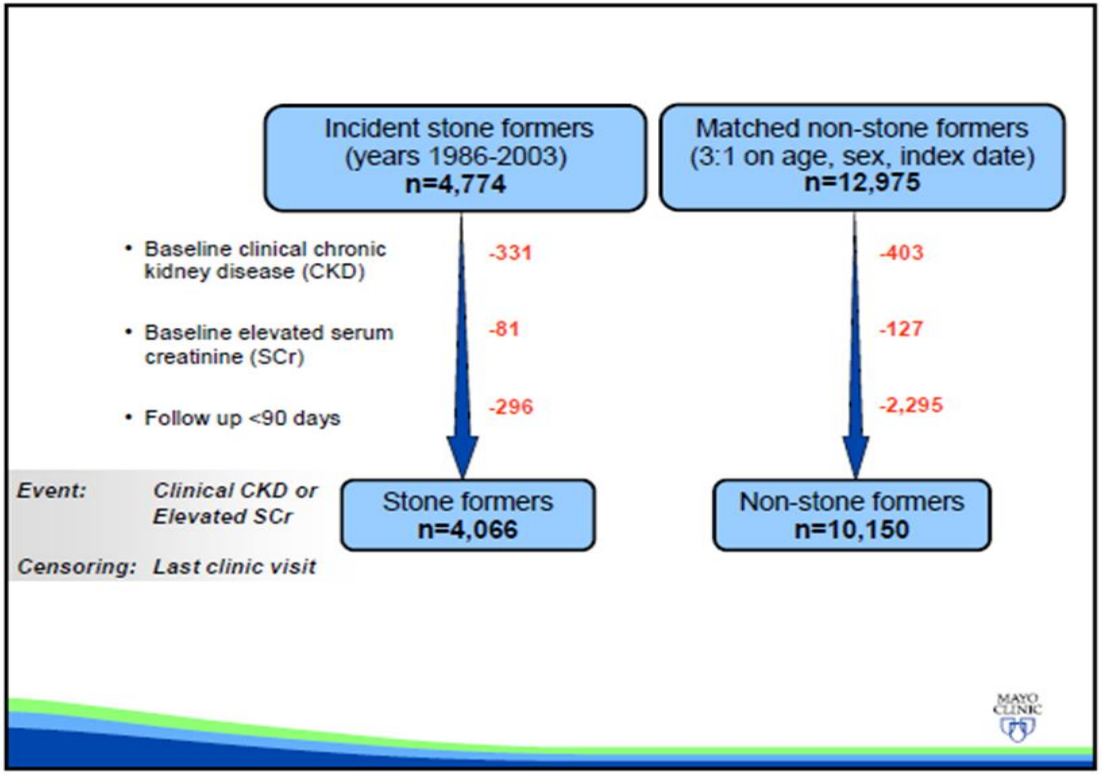
Ingsathit et al, NDT, 2010

MAYO CLINIC

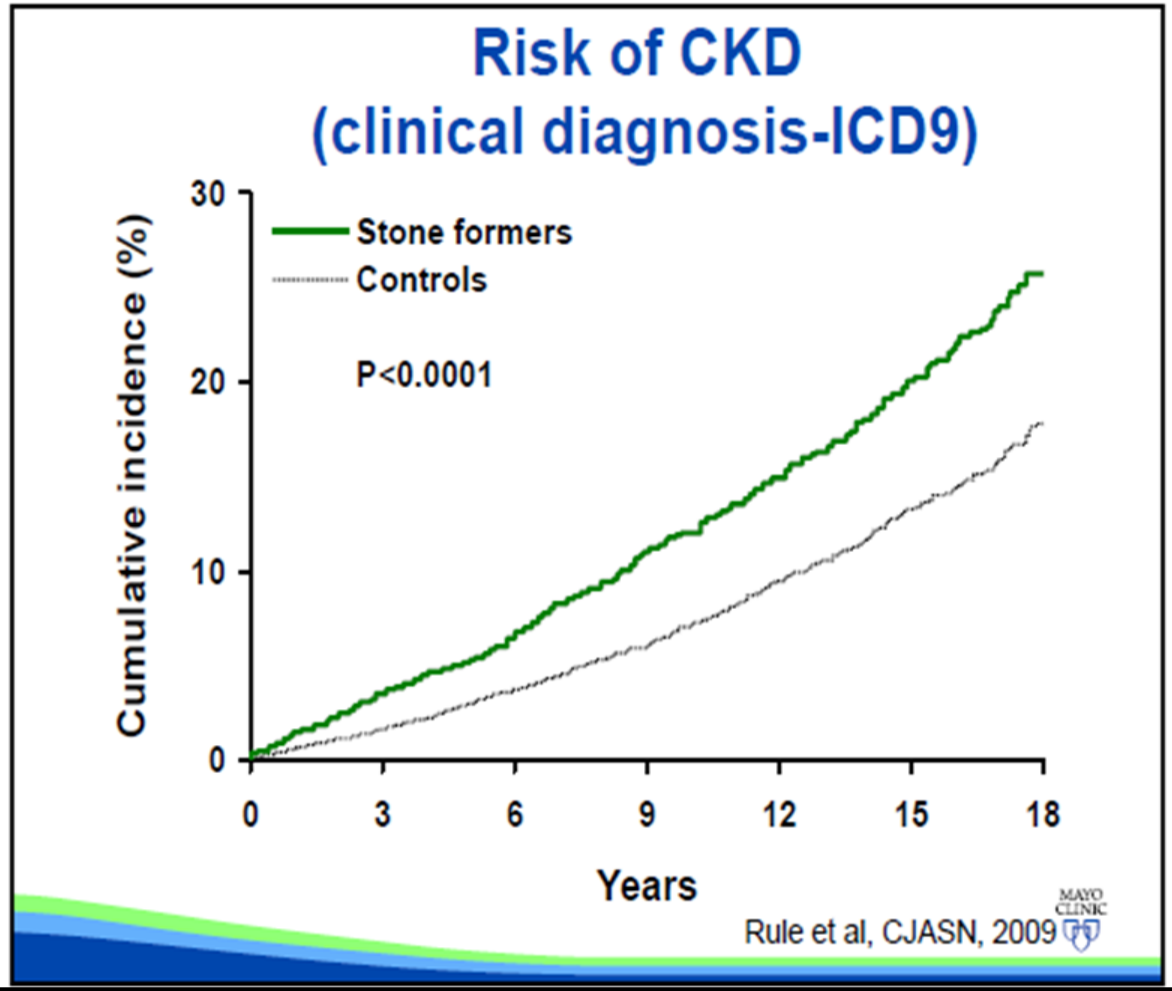
Rochester cohort: Relatie met co-morbiditeit



Follow up Rochester cohort

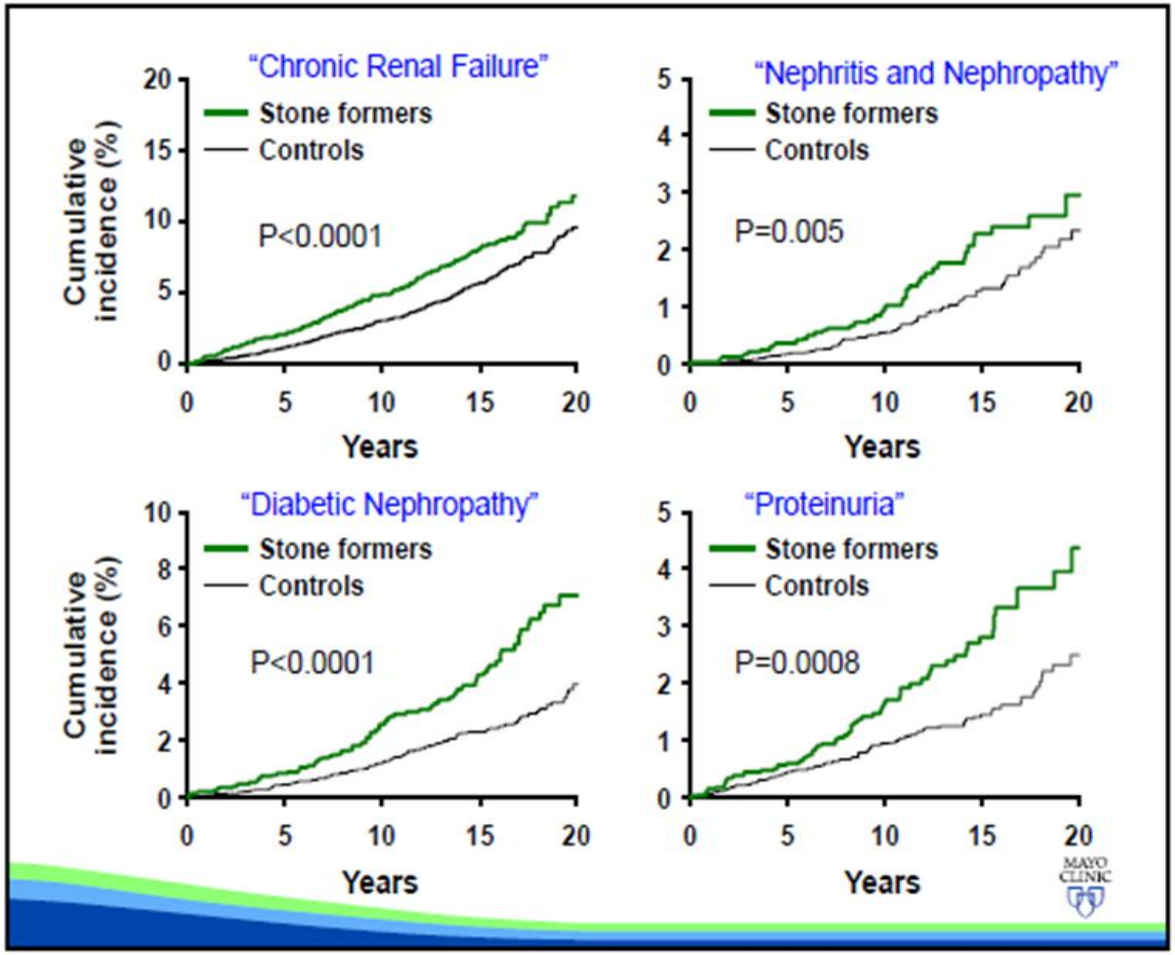


Risk CKD Rochestor Cohort (Mayo Clinics)



Risk CKD Rochestor Cohort (Mayo Clinics)

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY



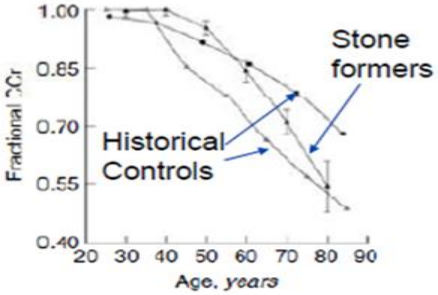
Relatie CKD & Urolithiasis

Chicago: Nierfunctieverlies bij steenvormers

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

Kidney loss in stone formers

- Sample: 3266 stone formers at a stone clinic (Univ. of Chicago)
- 115 (3.5%) had loss of function in one kidney:
  - 29% from stones (staghorn or high burden)
  - 23% from infection
  - 21% from obstruction
- More rapid decline in urinary creatinine clearance with age in stone formers over age 45 years.



Worcester E et al, Kidney Int, 2003

MAYO CLINIC

Paris: Incidence ESRD

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

ESRD attributed to kidney stones

- Sample: 1391 consecutive ESRD patients from 1989 to 2000 (Paris, France)
- ESRD attributed primarily to kidney stones in 3.2% (n=45)
  - Struvite stones in 42% (n=19)
  - Calcium stones in 27% (n=12)
    - 4 severe hypercalcuria
    - 2 primary hyperparathyroidism with nephrocalcinosis
    - 5 medullary sponge kidney with hypercalcuria
    - 2 recurrent UTIs
    - 1 distal RTA (sjogren's)
  - Uric acid stones in 18% (n=8)
  - Hereditary stones in 13.3% (n=6)
    - 4 primary hyperoxaluria
    - 2 cystinuria
- Solitary functioning kidney in 40% (n=18)

Jungers P et al, AJKD, 2004

MAYO CLINIC

USRDS: Incidence ESRD

PARTNER IN KIDNEYCARE
AMGEN®
NEPHROLOGY

Risk of ESRD revisited

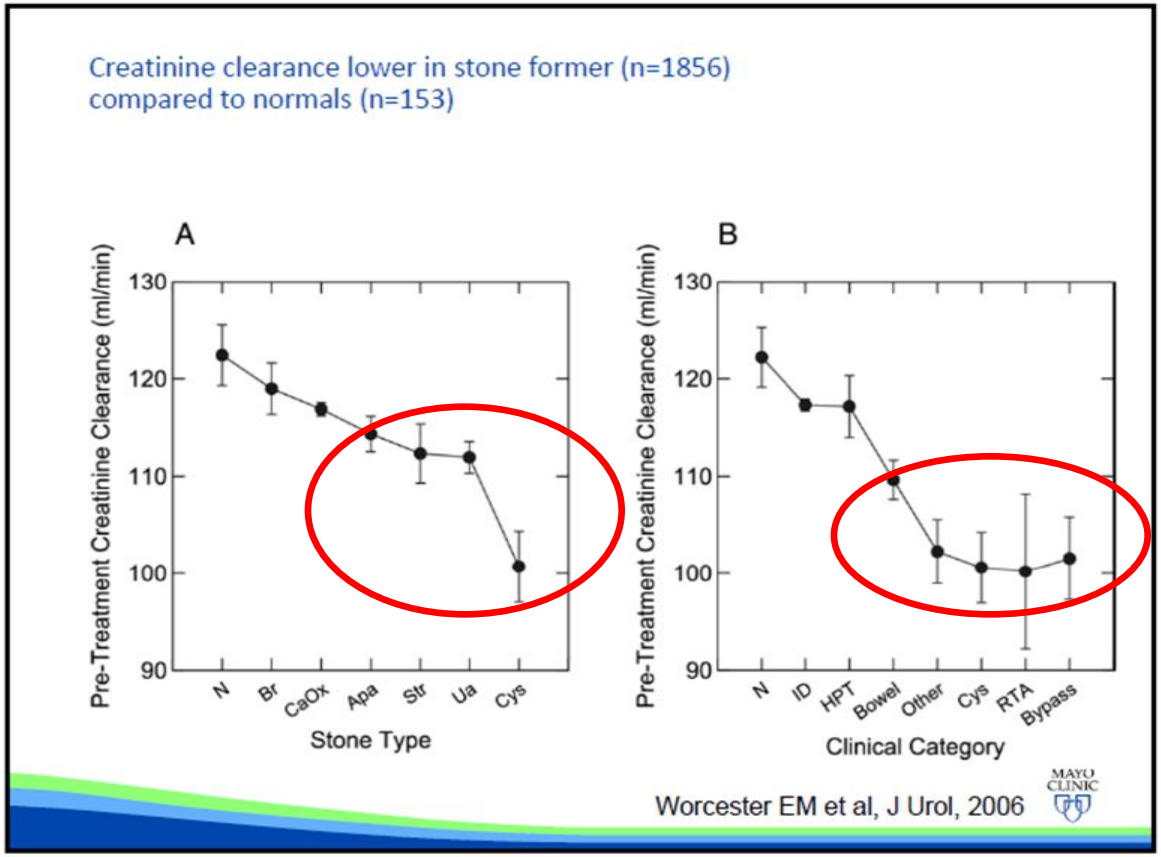
- Prior analysis relied on internal databases for ESRD and excluded baseline CKD.
- Repeated analysis USRDS database and internal ESRD databases with chart review (92 events).
- Incidence of ESRD

  Stone formers: 1.0 (95% CI: 0.7 to 1.4) events per 1000 person-years

  Controls: 0.5 (95% CI: 0.4 to 0.7) events per 1000 person-years
- Age-sex-adjusted HR=1.9 (95% CI: 1.3 to 2.9)
- Fully-adjusted HR=1.8 (95% CI: 1.2 to 2.7)
- Of the 41 stone formers who developed ESRD, only 3 had kidney stones as primary cause

MAYO CLINIC

Wie zijn wel at risk



Hoog risico Gastric Bypass

PARTNER IN KIDNEYCARE AMGEN®

[TH-PO137] Increased Risk for Calcium Oxalate Nephrolithiasis after Roux-en-Y Gastric Bypass Surgery Starts in the Early Post-Operative Period

Varun Agrawal, Daniel L. Landry, Xiao Jie Liu, Ann Lagoy, Inta Discenza, Thomas Campfield, John Romanelli, J. Enrique Silva, Gregory Lee Braden. Baystate Medical Center, Springfield MA
10:00 AM - 2:30 PM

Hyperoxaluria and nephrolithiasis are known complications of Roux-en-Y gastric bypass surgery (RYGB), but little is known if this stone risk starts in the early post-operative period and whether it changes with time. We prospectively studied 13 morbidly obese adults who underwent RYGB and had urine collections 2 weeks before, 1, 2, 4 and 6 months after surgery. Relative saturation ratio (RSR) with regard to calcium oxalate was computed by EQUIL. Non-parametric analyses were performed and results expressed as median (25th-75th %ile). Eleven subjects were female, median age was 40(36-48)years and none had history of diabetes or nephrolithiasis. Body mass index decreased from 44.6 (41.6-47.6)kg/m² to 34.1 (30.4-36.8)kg/m² in 6 months, p<0.0001. We observed significant decreases in urine volume [2100 (1537-3290) to 1360 (1200-1700)ml, p<0.0001], urine sodium [207.3 (145.6-258.4) to 92.5 (57.8-203.8)mmol/24h, p=0.002], urine potassium [70.1 (39.7-111.4) to 32.1 (22.4-53.8)mmol/24h, p<0.0001], urine magnesium [8.7 (4.2-14.1) to 7.1 (3.3-11.4)mg/24h, p=0.016], urine phosphorus [1.0 (0.7-1.2) to 0.5 (0.4-0.9)g/24h, p=0.01] , urine uric acid [0.6 (0.4-0.8) to 0.4 (0.3-0.6)g/24h, p=0.015] and creatinine clearance [144.0 (117.5-193.1) to 108.5 (90.8-164.8)ml/min, p=0.046]. The increase in urine oxalate approached significance [28.6 (18.7-49.7) to 51.6 (25.2-85.0)mg/24hour, p=0.054]. No change was seen in urine pH, 24 hour urine creatinine or 24 hour urine calcium excretion. Calcium oxalate RSR increased after RYGB [1.7 (1.2-3.6), 4.5 (1.6-9.2), 5.73 (2.1-12.2), 5.27 (2.7-9.1), 6.3 (3.4-13.9) at baseline, 1, 2, 4 and 6 months respectively, p=0.020). One patient had critical supersaturation (RSR=23.7) at 1 month that peaked at 42.3 at 6 months after RYGB. We conclude that calcium oxalate RSR and risk for nephrolithiasis start early and persist in the first 6 months after RYGB due to decreased urine volume, magnesium and increased urine oxalate. Studies of increased fluid intake and oral agents to bind enteric oxalate to reduce this risk are needed.

Course: Renal Week 2010: Abstract Sessions
Session: Poster Session: Bone and Mineral Disease: Ca/Mg/PO4, Stone Disease
Date/Time: Thursday, November 18, 2010 10:00 AM - 2:30 PM
Room: Halls A/B1/E2/F

Close Window

Asymptomatische Steenvormers China

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

Kidney stones and kidney function/morphology

	Group 1: No radiographic or past symptomatic stones (N=1719)	Group 2: Asymptomatic radiographic stones only (N=185)	Group 3: Past symptomatic stones (N=53)		
				P-value	
Kidney function measure	Mean or %	Mean or %	Mean or %	Group 1 vs 2	Group 1&2 vs 3
GFR, ml/min/1.73 m²	101	102	102	0.29	0.60
24-h urine alb >15 mg	9.0%	11%	23%	0.49	**0.0007**
24-h urine alb >30 mg	3.5%	3.6%	13%	0.96	**0.0002**
Focal scarring	2.9%	8.1%	11%	**0.0002**	**0.002**
Parenchymal thinning	0.6%	2.7%	1.9%	**0.004**	0.42

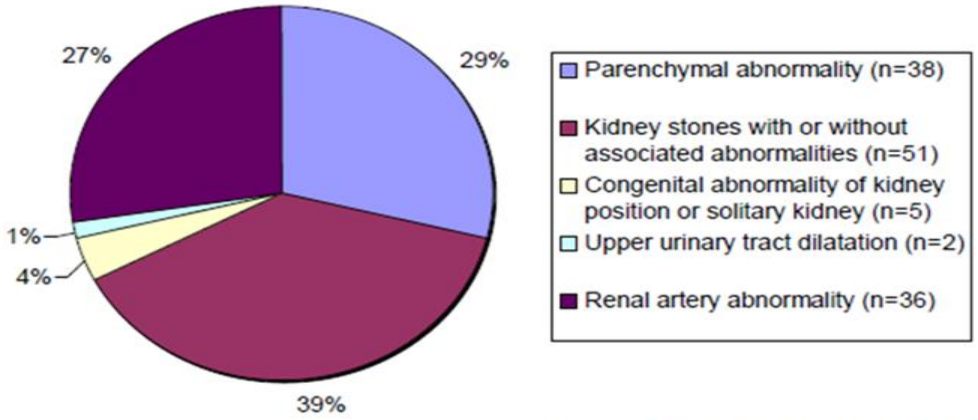
MAYO CLINIC

Asymptomatische Steenvormers

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

Kidney stones may be the most common incidental radiological abnormalities that contribute to potential kidney donor exclusion

n=132



Lorenz E et al., CJASN, 2010

MAYO CLINIC

Asymptomatische Steenvormers

PARTNER IN KIDNEYCARE
AMGEN®
NEPHROLOGY

Renal Histology Of Living Kidney Donors With And Without Kidney Stones

Merfake Semret, MD[1], John C. Lieske, MD, FASN[1], Lynn D. Cornell, MD[2], Elizabeth C. Lorenz, MD[1], Terri J Vrtiska, MD[3] and Andrew D. Rule, MD[1]
[1]Nephrology, [2]Anatomic Pathology, and [3]Radiology, Mayo Clinic, Rochester, MN

Background

Approximately 5% of women and 12% of men will have a kidney stone at some time in life.[1]

Kidney stone is shown to be associated with development of chronic kidney disease and hypertension.[2,3]

There are different mechanisms by which kidney stones might theoretically develop

- Free particle model
- Fixed particle model

Randall's plaques are interstitial calcium phosphate deposits at or near the papillary tip

- are associated with idiopathic calcium oxalate stones
- appear to originate in basement membranes of the thin loops of Henle
- the mechanisms by which they initially develop, expand, and become the nidus for calcium oxalate stones on papillary tips is uncertain.[4,5]

Other stone types (e.g., brushite) appear to develop from collecting duct plugs of calcium phosphate crystals.[6]

Study objectives

- To characterize the number and site of intrarenal crystals in donors with and without kidney stones
- To determine the association between kidney stones and presence of crystals on renal histology among kidney donors
- To determine the association between kidney stones and other renal histological features

Methods

- Living kidney donors from 2001 to 2009 (N=1221)
  - Renal pathology slides of 1168 (95.7%) were obtained
- Implantation kidney biopsy were reviewed manually for
  - presence of crystals
  - type of crystals using H&E-stained sections and polarizing light
- Report of CT scan of donors was reviewed for kidney stones
- History for symptomatic kidney stones was obtained from the records
- Nephrosclerosis was defined with two or more of
  - any glomerulosclerosis
  - any tubular atrophy
  - interstitial fibrosis >5%
  - any arteriosclerosis

Results

Living kidney donors characteristics (n=1159)

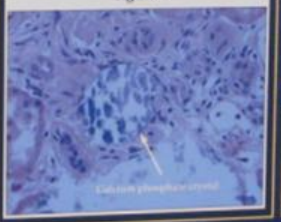
Age	43±15
Female	672 (58%)
Any crystal on renal histology	30 (2.5%)
Stone reported on CT scan	109 (9.4%)
Past symptomatic stone	25 (2.2%)
Nephrosclerosis	316 (27.4%)

Type of Crystals (n=30)

Ca Phosphate	29 (97%)
Ca Oxalate	1 (3%)
Uric acid	0
Cystine	0

Figure 1

Figure 2



Location of crystals (n=30)

Cortex	20 (67%)
Medulla	10 (33%)
Intraluminal	26 (87%)
Interstitial	4 (13%)

Symptomatic stone

		Present	
Radiographic stone	Present	8/109 (7%)	P=0.003
	Absent	17/1050 (1.6%)	

		Crystals	P-value
Radiographic stone	Present	1.7%	0.46
	Absent	2.2%	
Symptomatic stones	Present	12%	0.003
	Absent	2.4%	

		Nephrosclerosis	P-value
Radiographic stone	Present	27%	0.90
	Absent	28%	
Symptomatic stones	Present	40%	0.13
	Absent	27%	

Conclus

- Individuals with history of symp
  likely to have crystals in the kidne
  incidental asymptomatic stones.
- Thus, the pathogenesis of asympto
  stones may differ.
- Intraluminal crystals may particip
  kidney stones.
- No evidence that kidney stones we
  parenchymal injury (nephrosclero
  population with low stone burden.

Referenc

a. Pearle et al. Urologic diseases in Ame
Urol 2005; 173:848-57.
b. Rule et al. Kidney stones and the risk
disease. CJASN 2009; 4(4): 804-11.
c. Gillen et al. Nephrolithiasis and incre
among females with high body mass
49(2): 263-68.
d. Randall. The origin and growth of renal
1937; Jan;10 (6):1509-27.
e. Evan et al. Randall's plaque of patient
begins in basement membranes of thin
Invest. 2003; 111:607-616.

[TH-PO150] Renal Histology of Living Kidney Donors with and without Radiographic Stones and Past Symptomatic Stone Events

Merfake Semret, John C. Lieske, Lynn D. Cornell, Elizabeth C. Lorenz, Terri J. Vrtiska, Andrew D. Rule. Nephrology, Mayo Clinic, Rochester, MN; Anatomic Pathology, Mayo Clinic, Rocheste Radiology, Mayo Clinic, Rochester, MN

10:00 AM - 2:30 PM

Background: Certain risk factors for kidney stones (age, hypertension, obesity, hyperuricemia) associate with nephrosclerosis or increased nephron size on renal biopsy. Our objective was to determine if ki stones were associated with changes in renal histology among living kidney donors.

Methods: Kidney donors at the Mayo Clinic from 2001 and 2009 were identified. During donor evaluation, radiographic kidney stones from computed tomography scans and past symptomatic kidney stones f notes were identified. Renal biopsies at the time of transplant were reviewed for the presence of crystals, including using polarizing light microscopy for detection of Ca-Oxalate crystals. Nephrosclerosis was determined from 2 or more of the following: any glomerulosclerosis, any tubular atrophy, interstitial fibrosis >5%, any arteriosclerosis. Cortex per glomerulus (mm2), a measure of nephron size, was calcula [sectioned width x length x % cortex/number of glomeruli].

Results: There were 1143 kidney donors (58% female, mean age 44 years) of which 107 (9.4%) had radiographic stones and 21 (1.8%) had past symptomatic stones. Between persons with and without radi stones, there was no difference in the prevalence of crystals (3 vs 2%, p=0.54), nephrosclerosis (28% vs 28%, p=0.93), or nephron size (mean 0.48 vs 0.49 mm2, p=0.80). Between persons with and witho symptomatic stones, there was a difference in the prevalence of crystals (10 vs 2%, p=0.013), and possibly nephrosclerosis (43% vs 27%, p=0.12), but not nephron size (mean 0.48 vs 0.48, p=0.98). Howe age adjustment there is no association between past symptomatic stones and nephrosclerosis (p=0.52). Of the 23 donors with renal crystals, 21 had Ca-Phosphate, 3 had Ca-oxalate and 15 were in cortex.

Conclusion: There is no evidence that radiographic or past symptomatic kidney stones associate with nephrosclerosis or nephron size. Crystals in the cortex may contribute to kidney stones particularly in pe with past symptomatic stone passage.

Course: Renal Week 2010: Abstract Sessions
Session: Poster Session: Bone and Mineral Disease: Ca/Mg/PO4, Stone Disease
Date/Time: Thursday, November 18, 2010 10:00 AM - 2:30 PM
Room: Halls A/B1/E2/F

Close Window

Post test quiz (1) Antwoorden

Waar of niet waar ?

- De incidentie van galstenen en nierstenen zijn aan elkaar gerelateerd **(Waar)**
- Ptn. met ca-oxalaat stenen hebben een verhoogd cardiovasculair risico **(Waar, Rochester Cohort)**
- Ptn. met behandelde hypertensie hebben een verhoogde kans op het ontwikkelen van nierstenen **(Niet Waar indien beh. met HCT)**
- Ptn. die calcium bevattende nierstenen hebben dienen een calcium bepekrt dieet te volgen en oa minder melk te drinken **(Niet Waar)**

Galstenen en nierstenen

PARTNER IN KIDNEYCARE
AMGEN®
NEPHROLOGY

[TH-PO140] Gallstones and the Risk of Nephrolithiasis

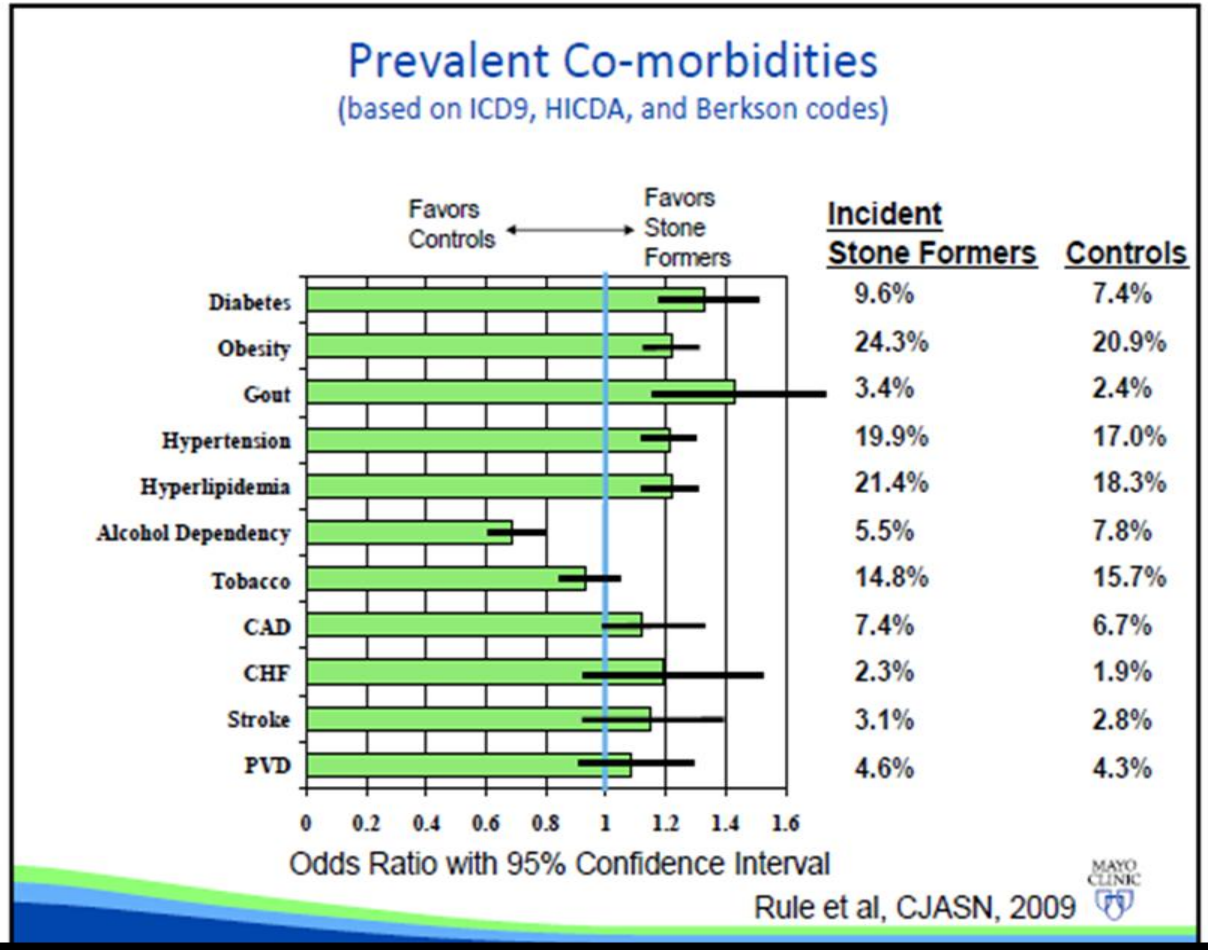
Eric N. Taylor, Gary C. Curhan. Division of Nephrology and Transplantation, Maine Medical Center, Portland, ME; Channing Laboratory, Brigham and Women's Hospital, Boston, MA; Renal Division, Brigham and Women's Hospital, Boston, MA
10:00 AM - 2:30 PM

Background. Existing data on the potential association between gallstones and nephrolithiasis are suggestive but limited.
Methods. To evaluate the relation between symptomatic radiographically confirmed gallstones and/or cholecystectomy (GS) and prevalent kidney stones (KS), we conducted a cross-sectional study of three large cohorts including over 240,000 participants: the Nurses' Health Study I (older women), the Nurses' Health Study II (younger women), and the Health Professionals Follow-up Study (men). We then prospectively studied the association between history of GS and incident symptomatic KS over a combined 56 years of follow-up. We also prospectively examined the relation between history of KS and incident GS. Multivariate regression models adjusted for age, body size, thiazide diuretic use, fluid intake, diet, and other factors.
Results. At baseline, the multivariate odds ratio of prevalent KS in individuals with GS compared to individuals without was 1.67 (95 % CI 1.48 to 1.89) in older women, 1.87 (95% CI 1.67 to 2.10) in younger women, and 1.62 (95% CI 1.41 to 1.85) in men. Prospectively, the multivariate relative risk of incident KS in participants with GS compared to participants without was 1.32 (95 % CI 1.16 to 1.51) in older women, 1.35 (95% CI 1.17 to 1.55) in younger women, and 1.34 (95% CI 1.10 to 1.64) in men. The multivariate relative risk of incident GS in participants with a history of KS compared to participants without was 1.18 (95 % CI 1.07 to 1.30) in older women, 1.29 (95% CI 1.17 to 1.42) in younger women, and 1.40 (95% CI 1.29 to 1.69) in men. Prospective "lag" analyses instituting a delay of 4 years between the diagnoses of GS and KS yielded similar results.
Conclusion. Gallstones are associated with kidney stones, independent of diet, body size, and other factors. Additional studies are needed to elucidate potential mechanisms underlying this association.

Course: Renal Week 2010: Abstract Sessions
Session: Poster Session: Bone and Mineral Disease: Ca/Mg/PO4, Stone Disease
Date/Time: Thursday, November 18, 2010 10:00 AM - 2:30 PM
Room: Halls A/B1/E2/F

Close Window

Rochester cohort: Relatie met co-morbiditeit



Pre test quiz (2) Antwoorden

Waar of niet waar ?

- Kinderen drinken tegenwoordig gelukkig minder melk, reden waarom de incidentie van nierstenen bij kinderen momenteel daalt **(Niet Waar)**
- Ptn. die urinezuurbevattende nierstenen produceren dienen met allopurinol behandeld te worden en hebben daardoor netto uiteindelijk een verlaagd cardiovasculair risico **(Waar ?)**

Effect of Allopurinol in Chronic Kidney Disease Progression and Cardiovascular Risk

Marian Goicoechea, Soledad García de Vinuesa, Ursula Verdalles, Caridad Ruiz-Caro, Jara Ampuero, Abraham Rincón, David Arroyo, José Luño

[+] Author Affiliations

Correspondence:
Dr. Marian Goicoechea, Nephrology Unit, Hospital General Universitario Gregorio Marañón, C/Drive Esquerdo, 46, 28007 Madrid, Spain. Phone: 0034915868319; Fax: 0034915868683; E-mail: albvia@terra.es

Abstract

Background and objectives: Hyperuricemia is associated with hypertension, inflammation, renal disease progression, and cardiovascular disease. However, no data are available regarding the effect of allopurinol in patients with chronic kidney disease.

Design, setting, participants, & measurements: We conducted a prospective, randomized trial of 113 patients with estimated GFR (eGFR) ≤60 ml/min. Patients were randomly assigned to treatment with allopurinol 100 mg/d (n = 57) or to continue the usual therapy (n = 56). Clinical, biochemical, and inflammatory parameters were measured at baseline and at 6, 12, and 24 months of treatment. The objectives of study were: (*1*) renal disease progression; (*2*) cardiovascular events; and (*3*) hospitalizations of any causes.

Results: Serum uric acid and C-reactive protein levels were significantly decreased in subjects treated with allopurinol. In the control group, eGFR decreased 3.3 ± 1.2 ml/min per 1.73 m^2, and in the allopurinol group, eGFR increased 1.3 ± 1.3 ml/min per 1.73 m^2 after 24 months. Allopurinol treatment slowed down renal disease progression independently of age, gender, diabetes, C-reactive protein, albuminuria, and renin-angiotensin system blockers use. After a mean follow-up time of 23.4 ± 7.8 months, 22 patients suffered a cardiovascular event. Diabetes mellitus, previous coronary heart disease, and C-reactive protein levels increased cardiovascular risk. Allopurinol treatment reduces risk of cardiovascular events in 71% compared with standard therapy.

Conclusions: Allopurinol decreases C-reactive protein and slows down the progression of renal disease in patients with chronic kidney disease. In addition, allopurinol reduces cardiovascular and hospitalization risk in these subjects.

This Article

Published online before print June 2010, doi: 10.2215/CJN.01580210
CJASN August 2010 vol. 5 no. 8 1388-1393

» Abstract *Free*
Full Text
Full Text (PDF)

[−] Classifications

Original Articles
Chronic Kidney Disease

[−] Services

Email this article to a colleague
Alert me when this article is cited
Alert me if a correction is posted
Similar articles in this journ
Similar articles in PubMed
Download to citation manager
© Get Permissions

[+] Citing Articles
[+] Google Scholar
[+] PubMed

Allopurinol & Sympt. Steenvormers

PARTNER IN KIDNEYCARE AMGEN® NEPHROLOGY

Nested Case/Control study within stone former cohort

- Among Olmsted County, MN stone formers: 53 who developed CKD were age-sex-matched to 106 who did not develop CKD.
- Risk factors for CKD:
  - Hypertension
  - Diabetes
  - Frequent UTIs
  - Struvite stones
  - Allopurinol use.
- Number of stone episodes and surgical procedures not associated with CKD
- Study was had limited power (could only detect OR > 3)
- Stone type unknown in 50% of community stone formers and even fewer had urine chemistry data.

Saucier NA et al., AJKD, 2009

MAYO CLINIC

PARTNER IN KIDNEYCARE
AMGEN®
NEPHROLOGY

Take home message(s):

Conclusion

- As a group, symptomatic stone formers are at increased risk of developing CKD and ESRD.
- Nephrolithiasis and CKD share many of the same risk factors (hypertension, diabetes, obesity, hyperuricemia) but there is an association independent of these risk factors.
- The risk of CKD varies by type of kidney stone.
  - Rare genetic diseases and struvite stone formers clearly have increased risk.
  - It is unknown if common calcium stone formers with infrequent episodes have an increased risk.
- Unlike symptomatic stone formers, persons with small incidental asymptomatic stones may not have the same risk of CKD.

MAYO CLINIC