

به نام خدا

Acibka

نفروتوکسین‌ها و کلیه

Kidney and Nephrotoxins

۱۳-۱۵ مهر ۱۴۰۱-تهران



Acute phosphate nephropathy

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Fall

1401

National nephrology congress

Tehran - IRAN



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Acute phosphate nephropathy

Definition

- **APhN** is a clinical pathological entity characterized by:
 - Acute and subsequent chronic renal failure following exposure to:
 - Oral sodium phosphate (OSP) bowel purgatives
 - Sodium phosphate-containing enemas

Kidney International (2009) 76, 1027–1034



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Acute phosphate nephropathy

Pathogenesis

- Phosphate exposure have a critical role
- In proximal tubule Na-P2a and Na-P 2c expression is down regulated by increases in serum P or PTH
- Na-P-2b present in the small intestine , levels increase in response to hypophosphatemia and vitamin D
- In contrast to renal Na-P- IIa, intestinal NaP-IIb expression requires days to respond to physiological changes.

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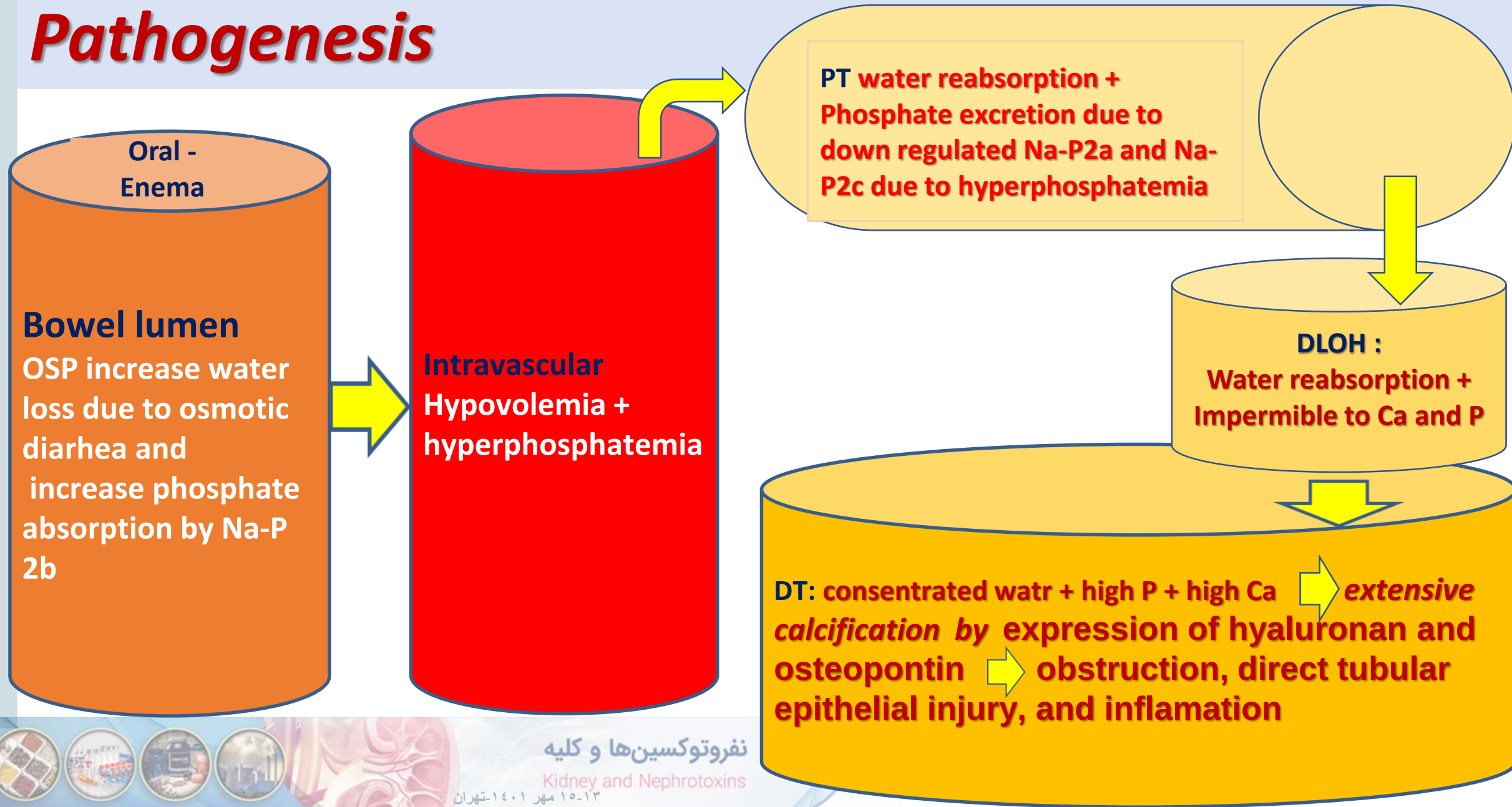
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Acute phosphate nephropathy

Pathogenesis



Acute phosphate nephropathy

Pathogenesis

- **Hyperphosphatemia occurs in the following settings:**
 - Excessive ingestion of phosphate over a short time period
 - Massive release of intracellular phosphate i.e. TLS , rhabdomyolysis
 - Phosphate ingestion in the setting of impaired gastrointestinal motility (increased absorptive time)
 - Renal dysfunction leading to reduced excretion



Oral Sodium Phosphate

- Is a hyperosmotic laxative that acts by drawing water into the Gi tract.
- Long time used as a laxative But began to used as a purgative for colonoscopy in 1990



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Oral Sodium Phosphate

- Frequently given in favor of standard polyethylene glycol (PEG)-based lavage solutions because of:
 - The smaller required volume
 - Results in better patient compliance
 - Improved colonic cleansing



Oral Sodium Phosphate

- Recommended regimen of OSP solution consisted of :
 - Two 45-ml doses taken 12 h apart, the evening before and the morning of colonoscopy.
 - Each 45-ml dose contained 5.8 g of elemental phosphorus.
 - Far exceeding the usual dietary intake of 1 g/day



Oral Sodium Phosphate

- On 11 December 2008, following continuing reports of APhN :
 - FDA issued that over-the-counter OSP products should no longer be used
 - but OSP tablets, offered by prescription only.



Oral Sodium Phosphate

- **FDA warning in 2014:**
 - Using more than one dose in 24 hours of OSP to treat constipation can cause :
 - “Rare but serious harm to the kidneys and heart, and even death”**



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Oral Sodium Phosphate

- Oral sodium phosphate remains available by prescription in a tablet form under the brand names **Visicol and Osmoprep**
 - A regimen of 20 tablets of Visicol, administered as three tablets with at least eight ounces of clear fluid every 15 min , has a cumulative sodium phosphate content that is near identical to a 45-ml of OSPS.
 - Osmoprep has largely replaced Visicol, and current recommendations are for the second administration to consist of 12 rather than 20 tablet





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ISSN 2196-5293

DOI 10.5414/CNCS110086
e-pub: April 16, 2021

Excessive elevation of serum phosphate during tumor lysis syndrome: Lessons from a particularly challenging case

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Acute Phosphate Nephropathy

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Keywords. acute kidney injury,
rhabdomyolysis, electrolyte
imbalance, hyperphosphatemia

We present acute phosphate nephropathy in a 28-year-old man, which was developed after a car accident due to rhabdomyolysis. Treatment of acute kidney injury was done with administration of sodium bicarbonate.

IJKD 2014;8:246-9
www.ijkd.org



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CLINICAL PRESENTATION AND *PROGNOSIS*

- **Acute and reversible kidney injury**
 - occurs within hours of the administration of OSP
 - associated with excessive dosing of OSP or other risk factors for hyperphosphatemia
 - AKI is due to prerenal factors or ATN rather than acute phosphate nephropathy
 - Occurs in setting of severe hyperphosphatemia and hypocalcemia, leading to tetany, cardiac arrest, and, in some cases, death
 - Who survive the immediate event typically return to normal or near-normal renal function.



CLINICAL PRESENTATION AND *PROGNOSIS*

- **Acute phosphate nephropathy**
 - Occur in asymptomatic patients, days to months following OSP administration
 - The serum P and Ca are normal when kidney injury is discovered
 - Confirmation by renal biopsy



Acute phosphate nephropathy

Diagnostic Criteria

- AKI
- Recent exposure to OSP bowel purgative
- Renal biopsy findings of acute and chronic tubular injury with abundant calcium phosphate deposits
- No evidence of hypercalcemia or conditions associated with hypercalcemia
- No other significant pattern of renal injury



Acute phosphate nephropathy

Pathology

- Renal biopsy findings in APhN involve the tubules
 - Within 3 weeks of OSP exposure, acute tubular degenerative changes predominate and resemble findings seen in ATN.
 - More than 3 weeks following OSPS exposure exhibit evidence of chronicity in the form of tubular atrophy and interstitial fibrosis
 - This pattern of renal injury described as an acute and chronic tubulointerstitial nephropathy



Acute phosphate nephropathy

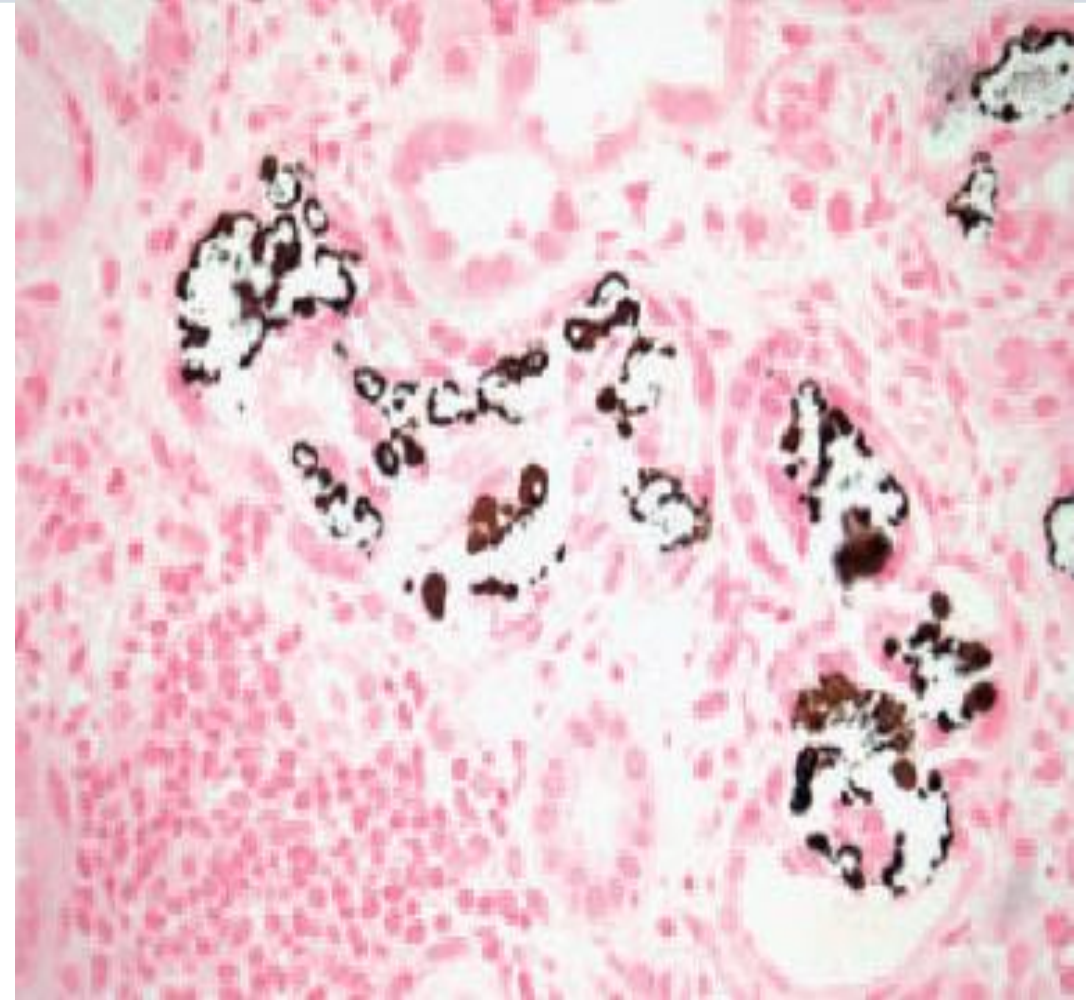
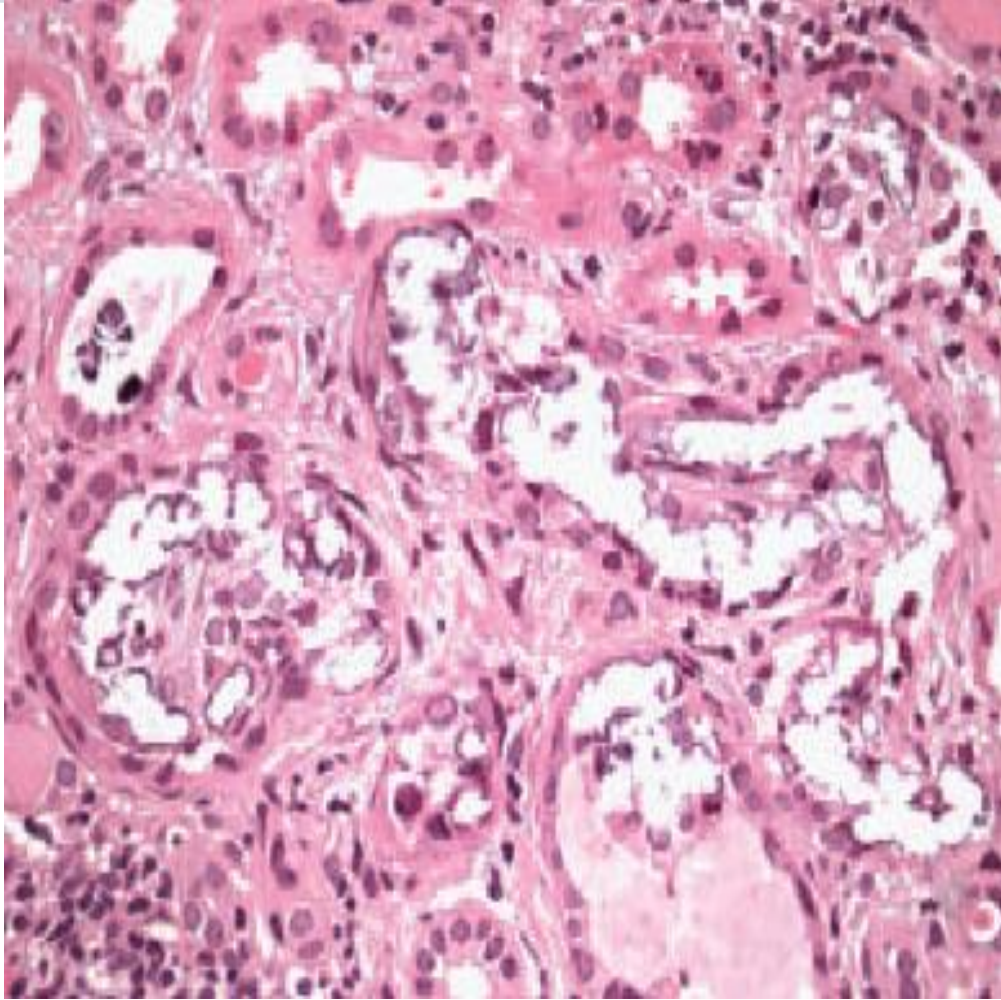
Pathology

- Regardless of the degree of acuity or chronicity, the hallmark of APhN is abundant tubular and less prominent interstitial calcium phosphate deposits
- The extent of tubular calcification is dependent on adequacy of tissue sampling but in biopsies with 10 or more glomeruli, >30 calcifications are typically encountered and >100 calcifications can be seen



Acute phosphate nephropathy

Pathology



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Acute phosphate nephropathy

Risk factors

- **Age>60**
 - more severe hyperphosphatemia in the elderly:
 - may relate to both age-related decline in GFR
 - increases in intestinal transit time
- **CKD stage 3 (GFR<60)**
 - Low GFR limits renal phosphate excretion and exposes the fewer functioning nephrons to a higher concentration of phosphate



Acute phosphate nephropathy

Risk factors

- **Hypertension :**
 - The effect of HTN relate to its effect on renal function and the associated vascular scarring, which can impair physiological adjustments to hypovolemia.
- **Female gender:**
 - Risk may be estrogen dependent (majority of women with APhN are post-menopausal)
 - Weight is a critical determinant of the hyperphosphatemia following the use of OSP



Acute phosphate nephropathy

Risk factors

- ACEis, ARBs, and diuretics are known to:
 - Exacerbate the pre-renal state
 - Decrease angiotensin-II-dependent bicarbonate reabsorption in the PT, inducing bicarbonaturia and promoting calcium phosphate precipitation in the DT
- Diabetes mellitus
- NSAIDS
- Phosphate dose
- Interval between OSP dosing
- Adequacy of hydration



- *One might predict that the risk of APhN would increase in parallel with the number of risk factors*



Prevention of APhN

- Avoiding OSP in high-risk patients
- Aggressive hydration before, during, and after OSP administration
- Minimizing the dose of OSP
- Maintaining a minimum of a 12 h interval between OSP administrations



Treatment of APhN

- There is no specific treatment for established APhN
- Acute HD is likely to benefit a patient who is diagnosed within 12 to 24 hours after OSP and still has marked hyperphosphatemia



REFERENCES

- Iranian Journal of Kidney Diseases | Volume 8 | Number 3 | May 2014
- Kidney International (2009) 76, 1027–1034
- J Am Soc Nephrol 16: 3389–3396, 2005
- Arch Intern Med 2012;172:263.
- Am J Gastroenterol 1990; 85:422
- Nephrol Dial Transplant 2005; 20:850.
- N Engl J Med 2008; 359:951
- Am J Gastroenterol 1993; 88:929.
- Arch Intern Med 2008; 168:593.
- J Am Soc Nephrol 2007; 18:3199.
- J Am Soc Nephrol 2007; 18:3192.
- Am J Gastroenterol 2007; 102:2655.
- Gastrointest Endosc 2006; 64:544.
- Am J Gastroenterol 2008; 103:2707
- Am J Kidney Dis 2016; 67:609.
- Kidney Int 2016; 90:13.



Thank you very much



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