

# Do Contrast Media damage the Kidney?



Prof. Dr. med. Pontus B. Persson

# Is there anything like PC-AKI?

- The risk of AKI from CM, ... has been exaggerated ...the risk is likely nonexistent in patients with normal renal function.

Wichmann et al. *Circulation* 2015

# Is there anything like PC-AKI?

## Entire Paired Population

		AKI (Noncontrast Scans)	
		Yes	No
AKI (Contrast Scans)	Yes	22 0.5%	172 4.0%
	No	187 4.4%	3884 91.1%

McNemar:  $\chi^2 = 0.63$ ,  $p = .43$

## First Scan: Contrast Exam

		AKI (Noncontrast Scans)	
		Yes	No
AKI (Contrast Scans)	Yes	14 0.6%	95 4.3%
	No	116 5.2%	1992 89.9%

McNemar:  $\chi^2 = 2.09$ ,  $p = .15$

## First Scan: Noncontrast Exam

		AKI (Noncontrast Scans)	
		Yes	No
AKI (Contrast Scans)	Yes	8 0.4%	77 3.8%
	No	71 3.5%	1892 92.4%

McNemar:  $\chi^2 = 0.24$ ,  $p = .62$

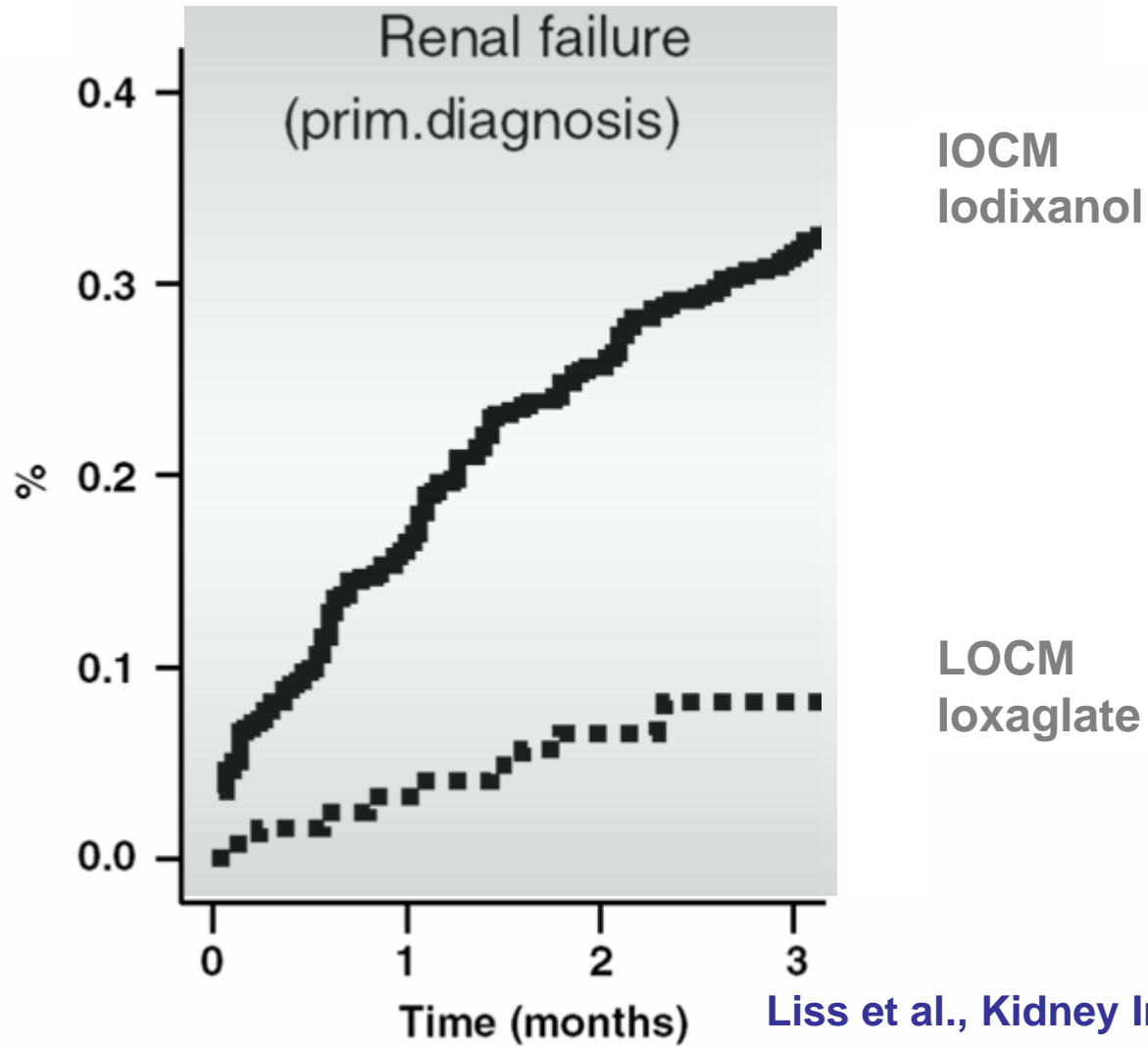
McDonald et al. Radiology 2015

# Renal failure in 57 925 patients undergoing coronary procedures using iso-osmolar or low-osmolar contrast media

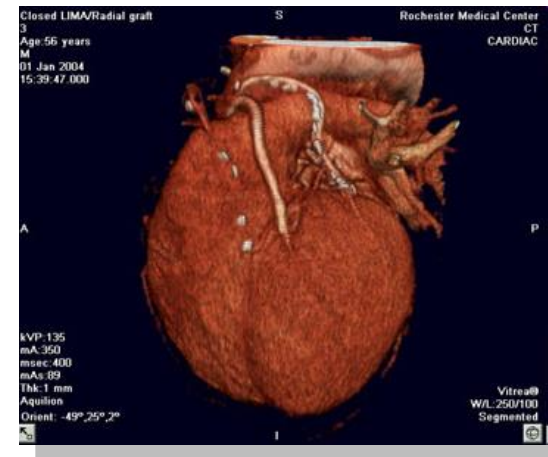
P Liss<sup>1,5</sup>, PB Persson<sup>2,5</sup>, P Hansell<sup>3</sup> and B Lagerqvist<sup>4</sup>

<sup>1</sup>Institute of Radiology, University of Uppsala, Uppsala, Sweden; <sup>2</sup>Institute of Physiology, Humboldt University Berlin, Berlin, Germany;

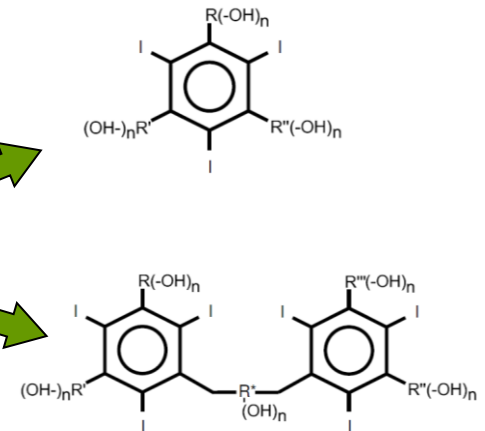
<sup>3</sup>Institute of Medical Cell Biology, University of Uppsala, Uppsala, Sweden and <sup>4</sup>Department of Cardiology, Uppsala University Hospital, Uppsala, Sweden

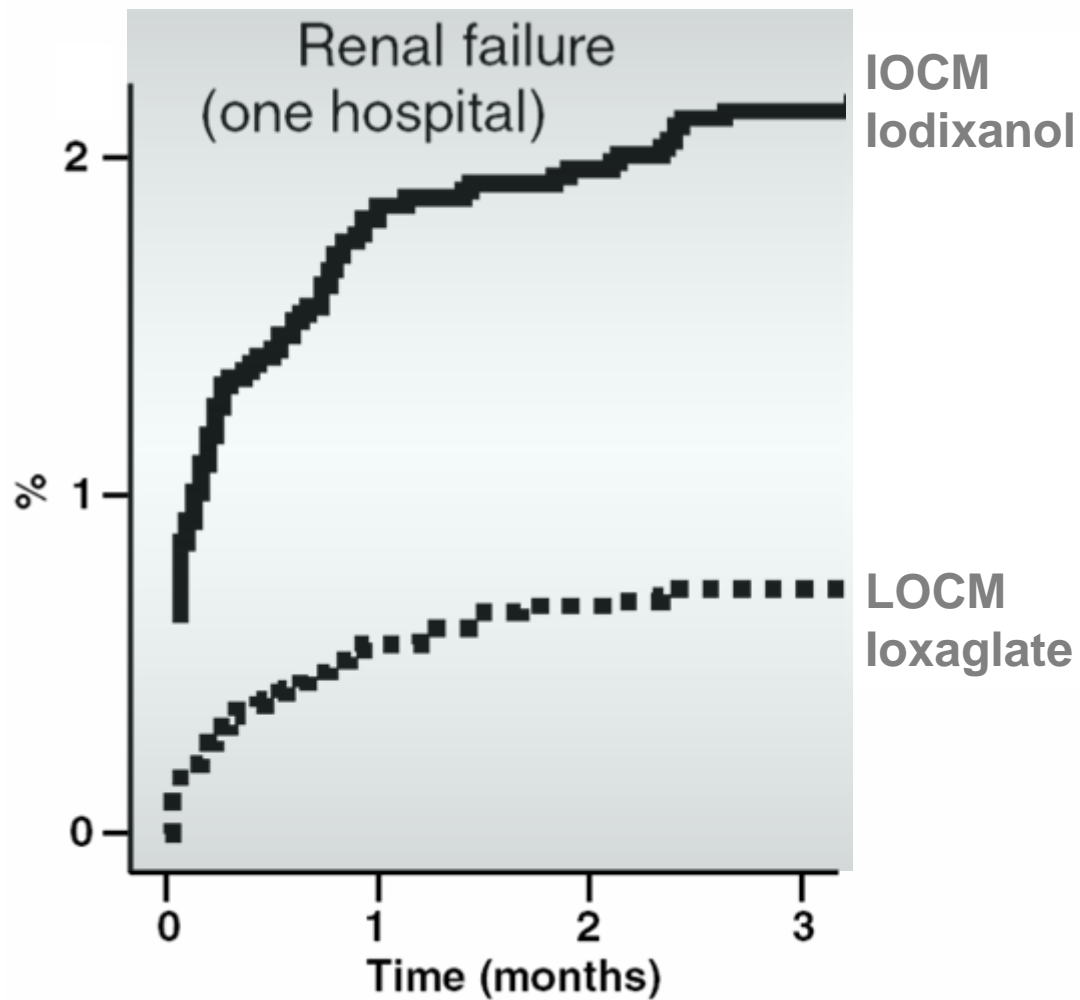


# Types of Contrast Media

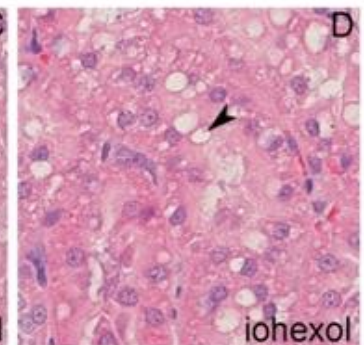
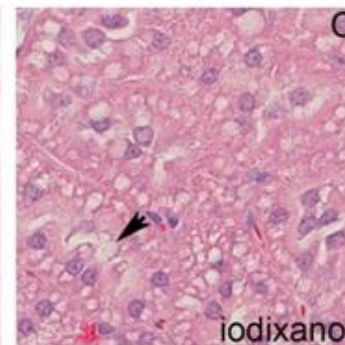
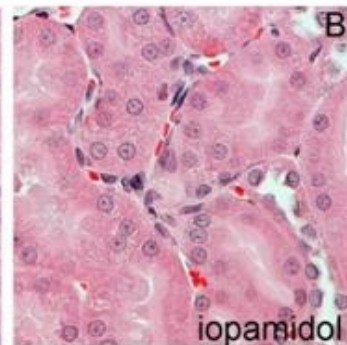
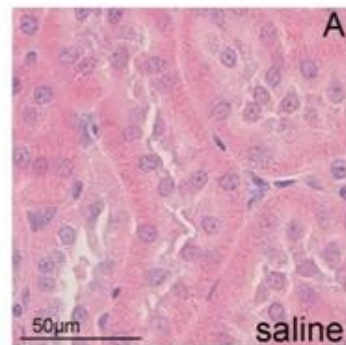
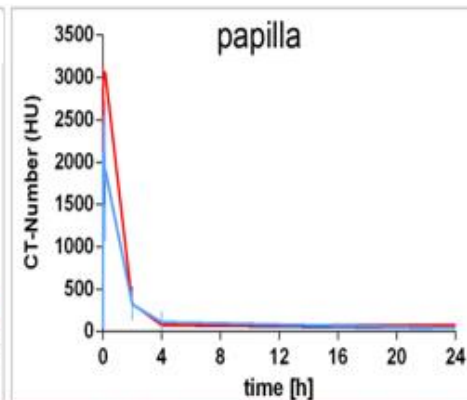
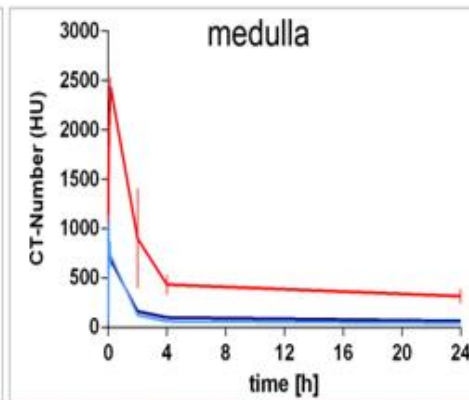
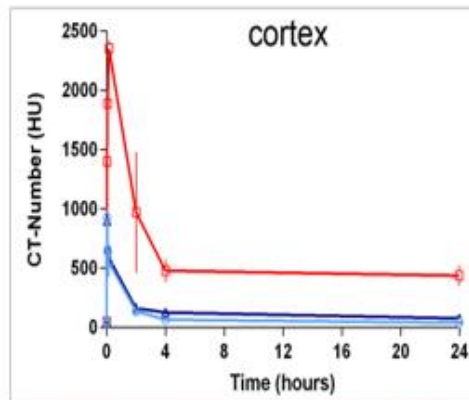
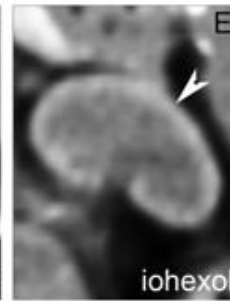
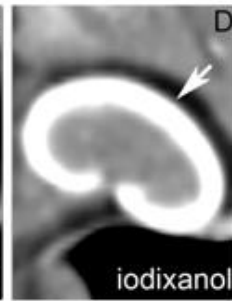
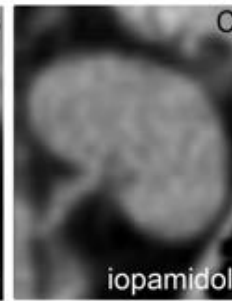
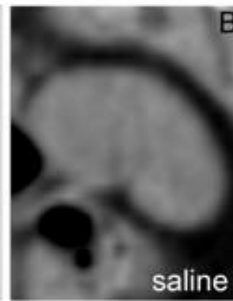
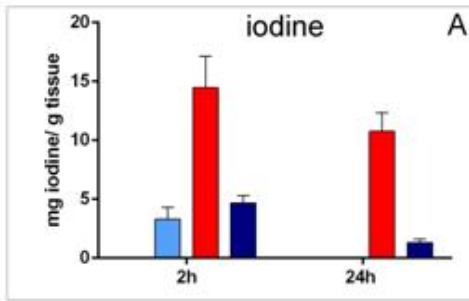


- Ionic
- Non-ionic
- High osmolar, low viscosity
- „Low osmolar“, low viscosity
- „Iso-osmolar“, high viscosity



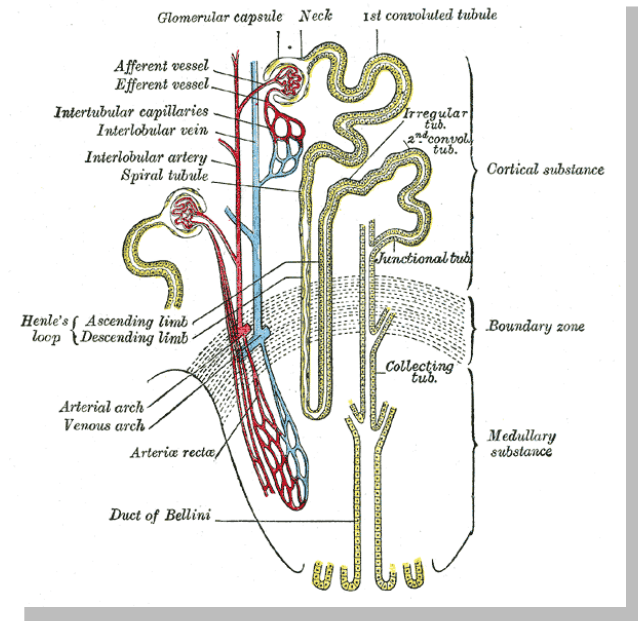


Liss et al., *Kidney Int.* 70: 1811-7 (2006)



# Tubular mechanisms in CI-AKI

Fluid Viscosity



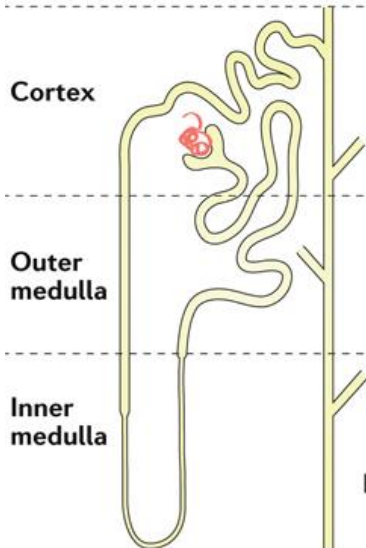
**a**

Clinically used solution

Cortex

Outer medulla

Inner medulla

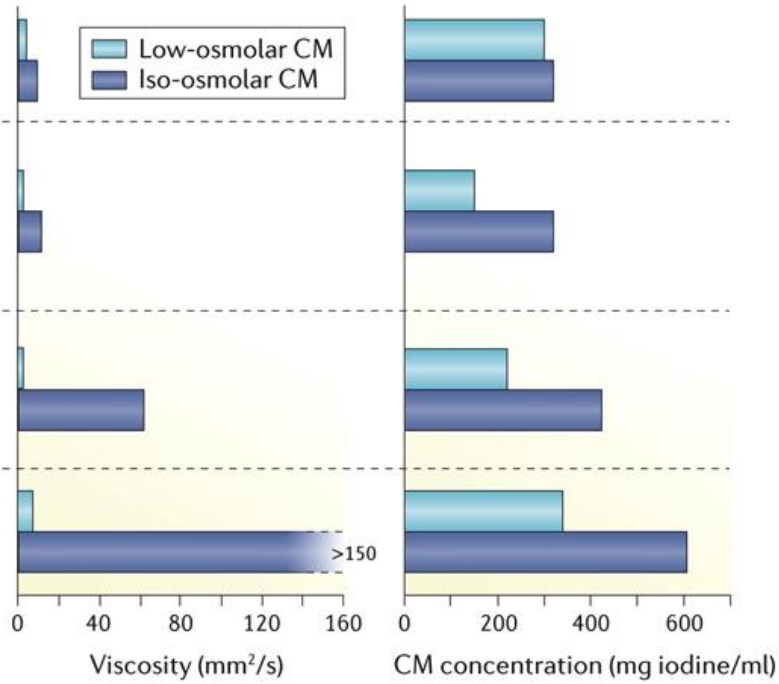


290

500

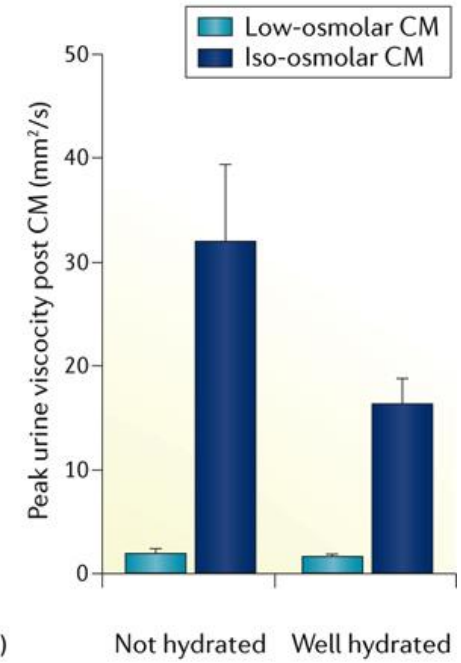
1,000

Interstitial average osmolality (mosmol/kg H<sub>2</sub>O)



**b**

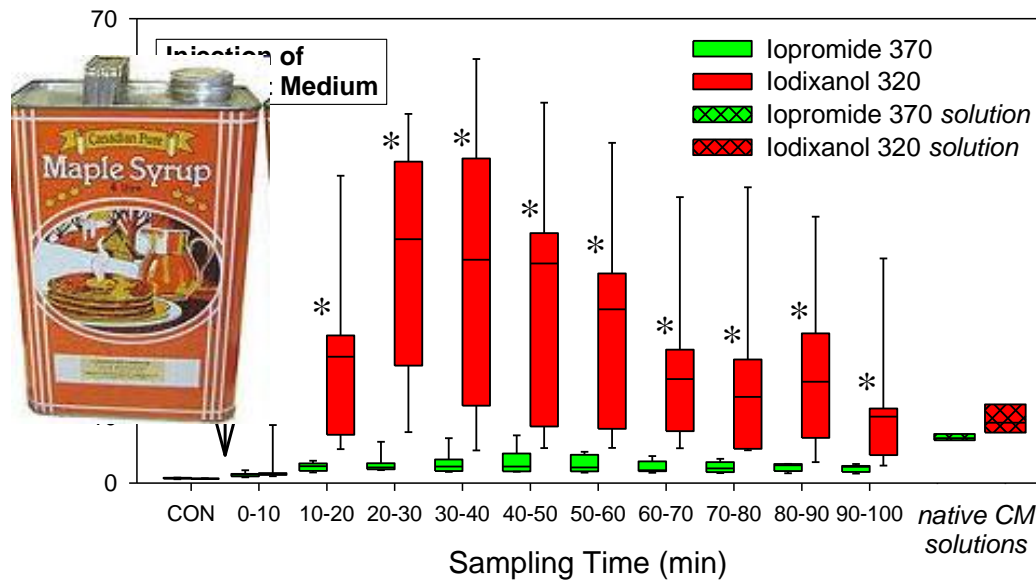
In vivo urine



Nature Reviews | [Nephrology](#)

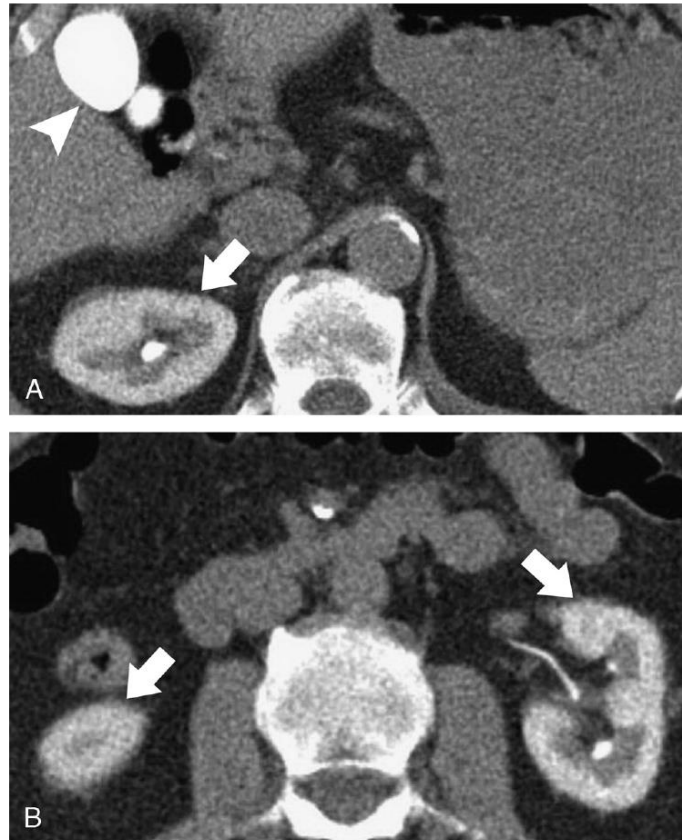


# Fluid Viscosity



Seeliger et al. Radiology 2010

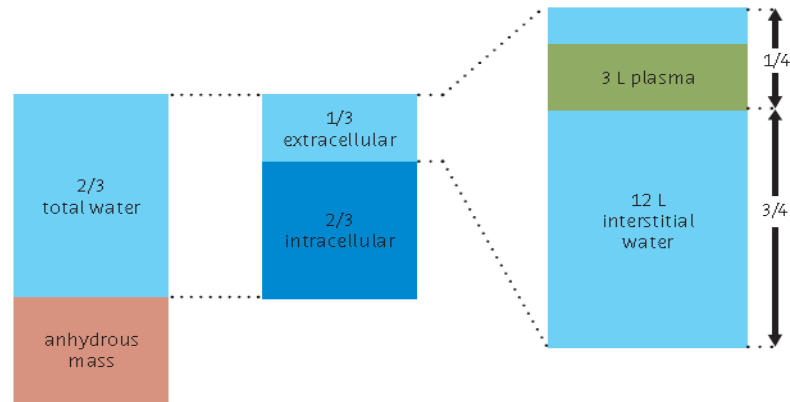
# Retention of iodixanol 24h after angioplasty



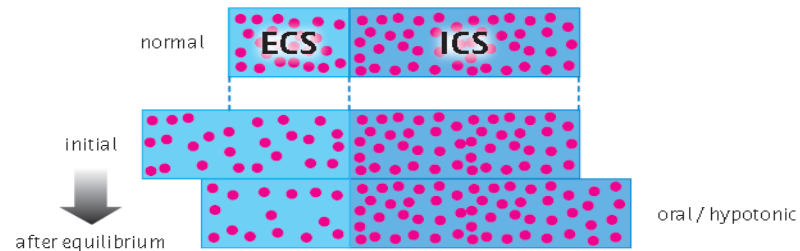
**FIGURE 3.** Axial unenhanced CT scan in an 80-year-old man 24 hours after angioplasties and placement of 3 stents. The procedure required 500 mL (2.2 g I/kg) of iodixanol 320 and 73.3 minutes of fluoroscopy time. Bilateral global nephrograms with corticomedullary distinction. Right kidney (A, arrow) with cortical attenuation of 150.17 HU and vicarious excretion into the gallbladder lumen (arrowhead). Lower abdominal image (B) through lower pole of right kidney and mid region of left kidney (arrows). Left kidney cortical attenuation of 158.8 HU.

Chu et al. Invest. Radiol. 2016

# Oral hydration

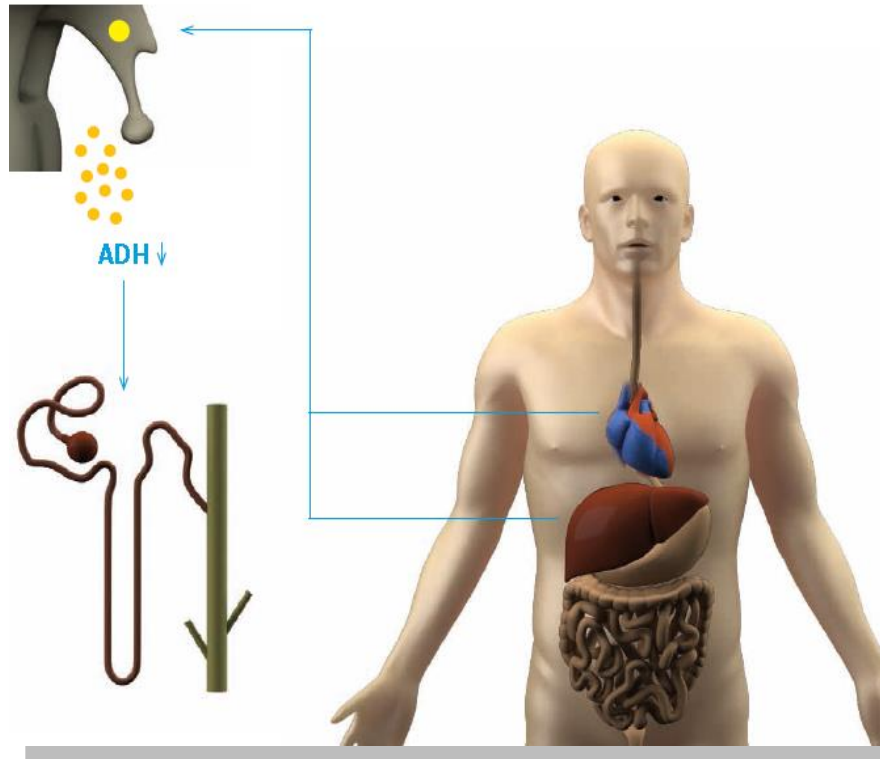


Fluid compartments of the body

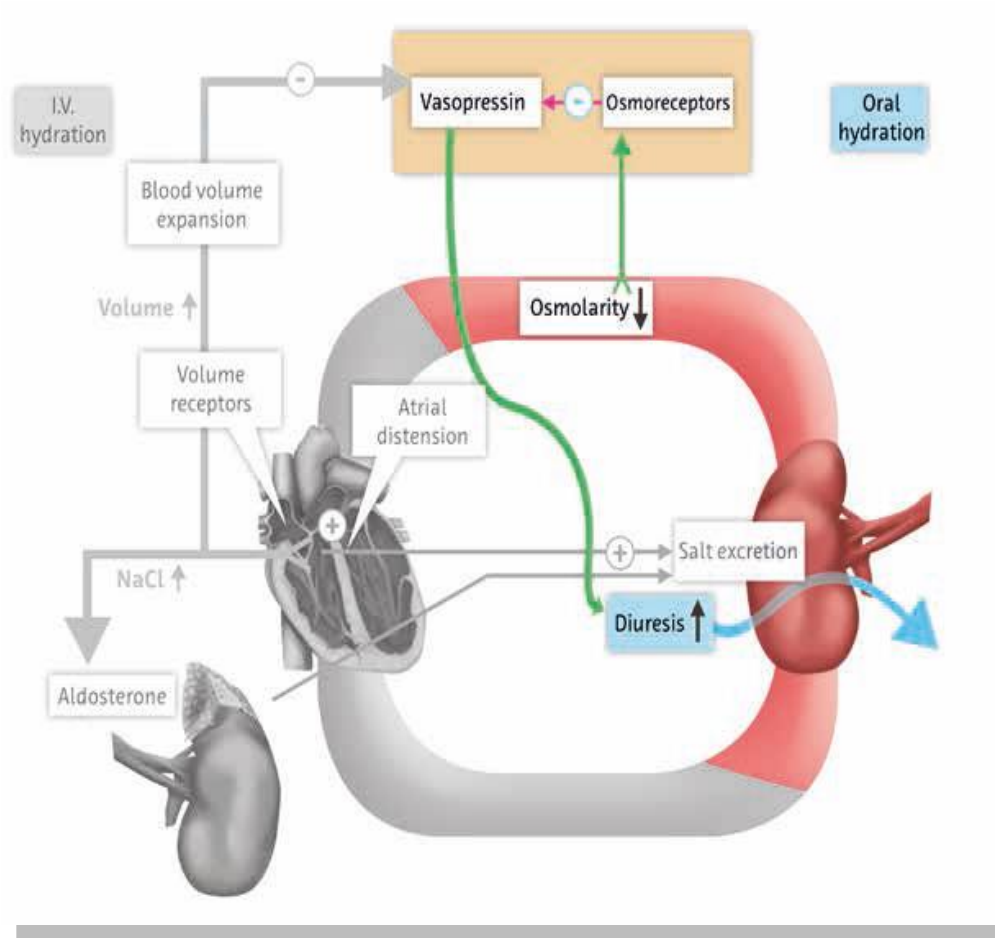


Oral hydration expands extracellular space

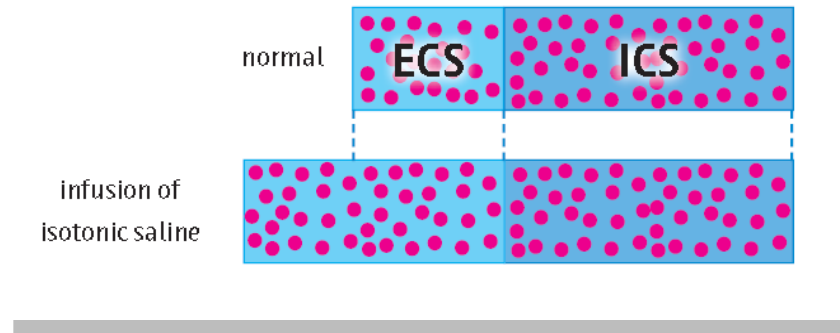
# How oral hydration works



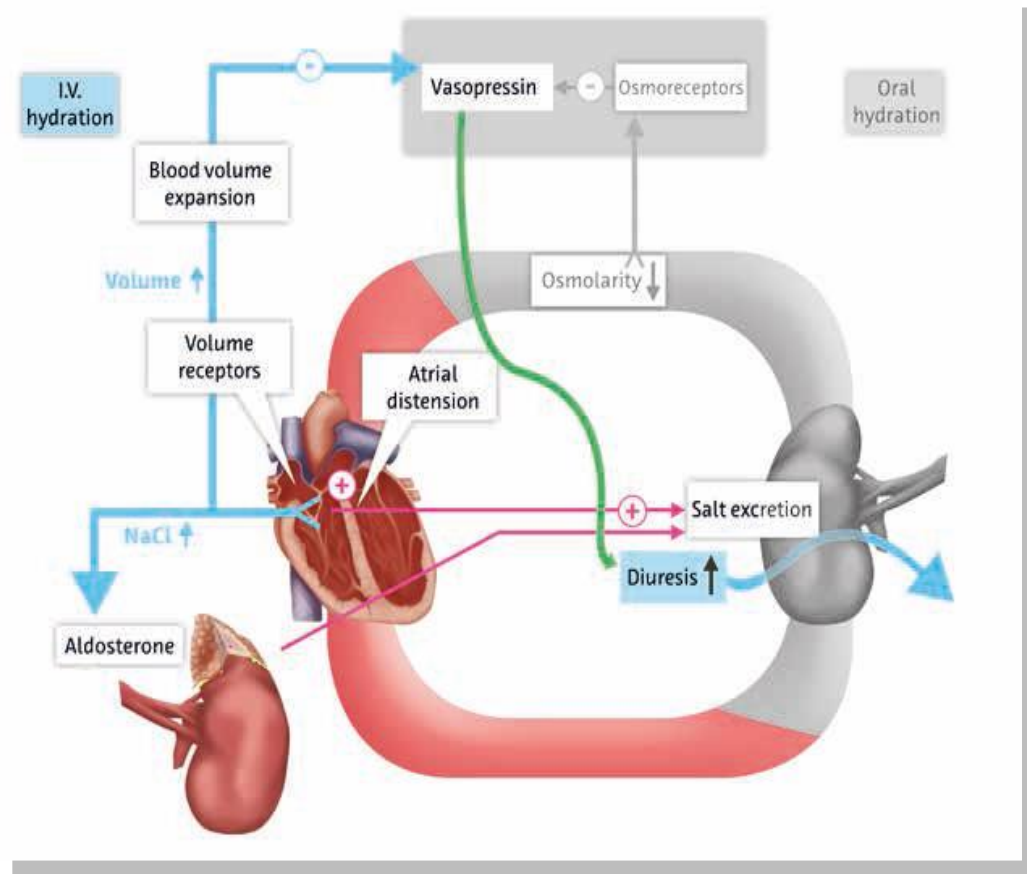
# How oral hydration works



# i.v. Saline infusion



# i.v. Saline Infusion



# Oral hydration: Pros and Cons



<b>Pro oral hydration</b>	<b>Keep in mind</b>
<b>Rapid onset (20-30 min)</b>	<b>Short duration</b>
<b>Easily applied</b>	
<b>Cost effective</b>	
<b>Time efficient</b>	

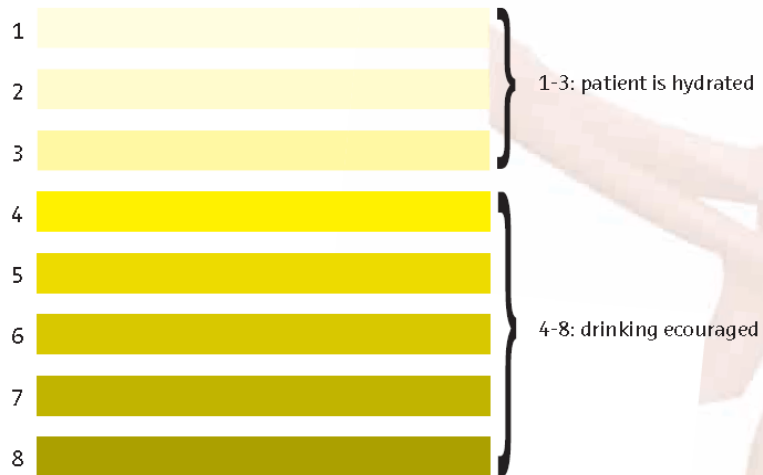
# Drink how much?



# How much to drink?



- ◆ the healthy kidneys excrete upto 1 l/hour
- ◆ never hydrate beyond reluctancy to drink
- ◆ modest drinking in patients with impaired cardiac or renal function
- ◆ no or little drinking in patients on dialysis



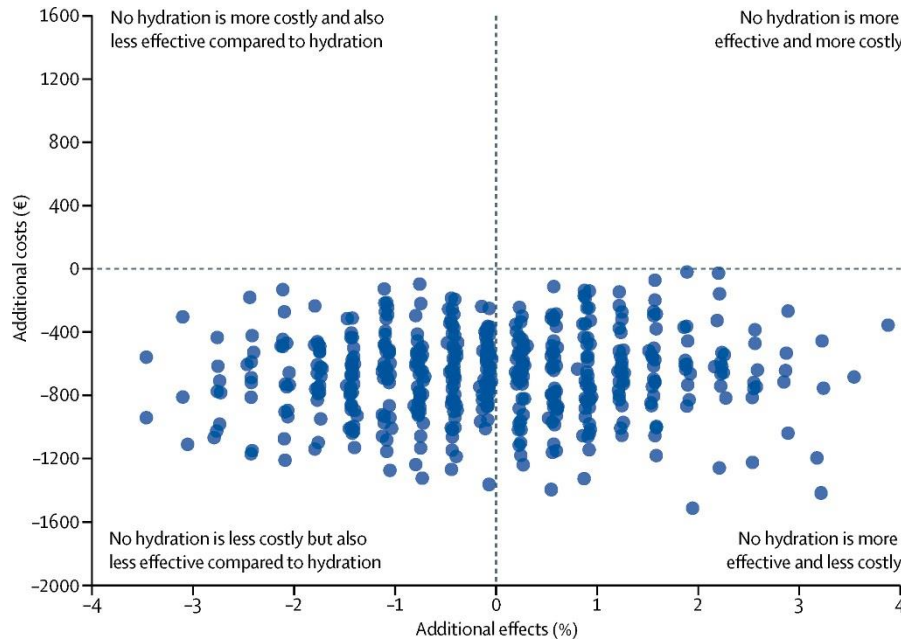
A urine color chart is a simple tool to assess if you are drinking enough.

**Cave: Be aware that medication and vitamin supplements may affect color!**

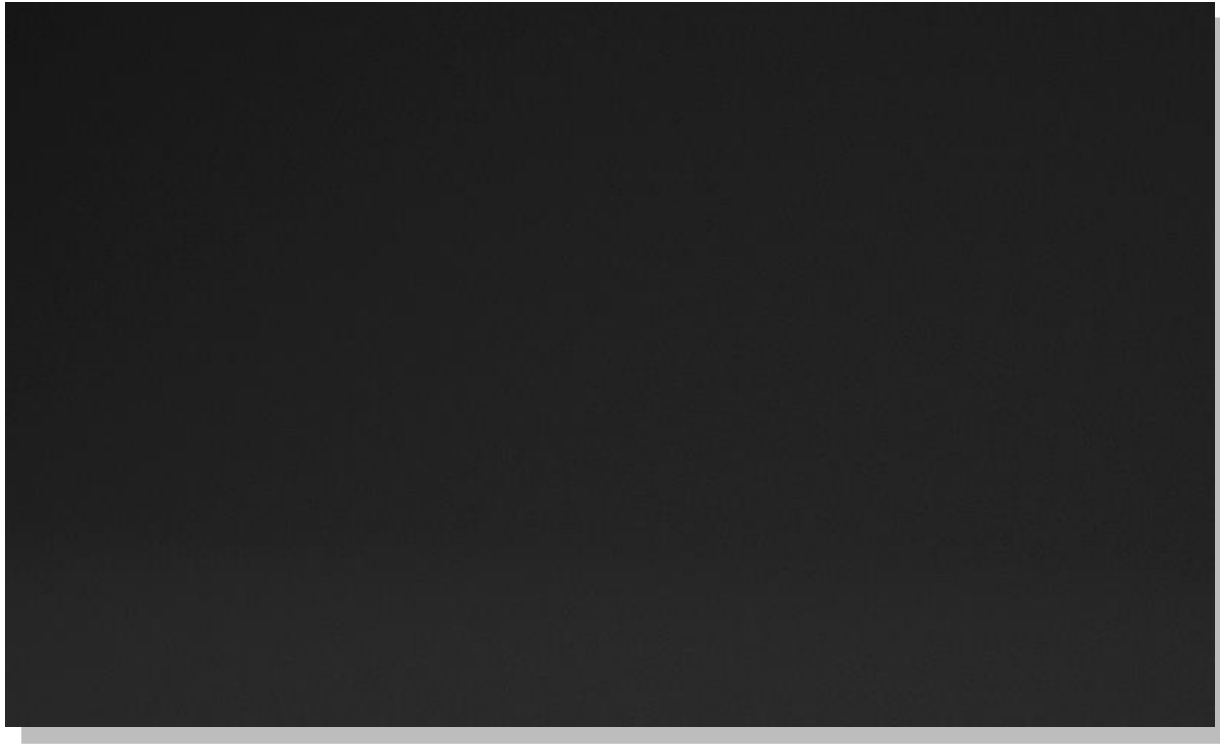


# Prophylactic hydration to protect renal function from intravascular iodinated contrast material in patients at high risk of contrast-induced nephropathy (AMACING): a prospective, randomised, phase 3, controlled, open-label, non-inferiority trial

Estelle C Nijssen, Roger J Rennenberg, Patty J Nelemans, Brigitte A Essers, Marga M Janssen, Marja A Vermeeren, Vincent van Ommen, Joachim E Wildberger



# Monomer oder Dimer?



# Post-Contrast AKI from the clinical Perspective



Prof. Dr. med. Pontus B. Persson