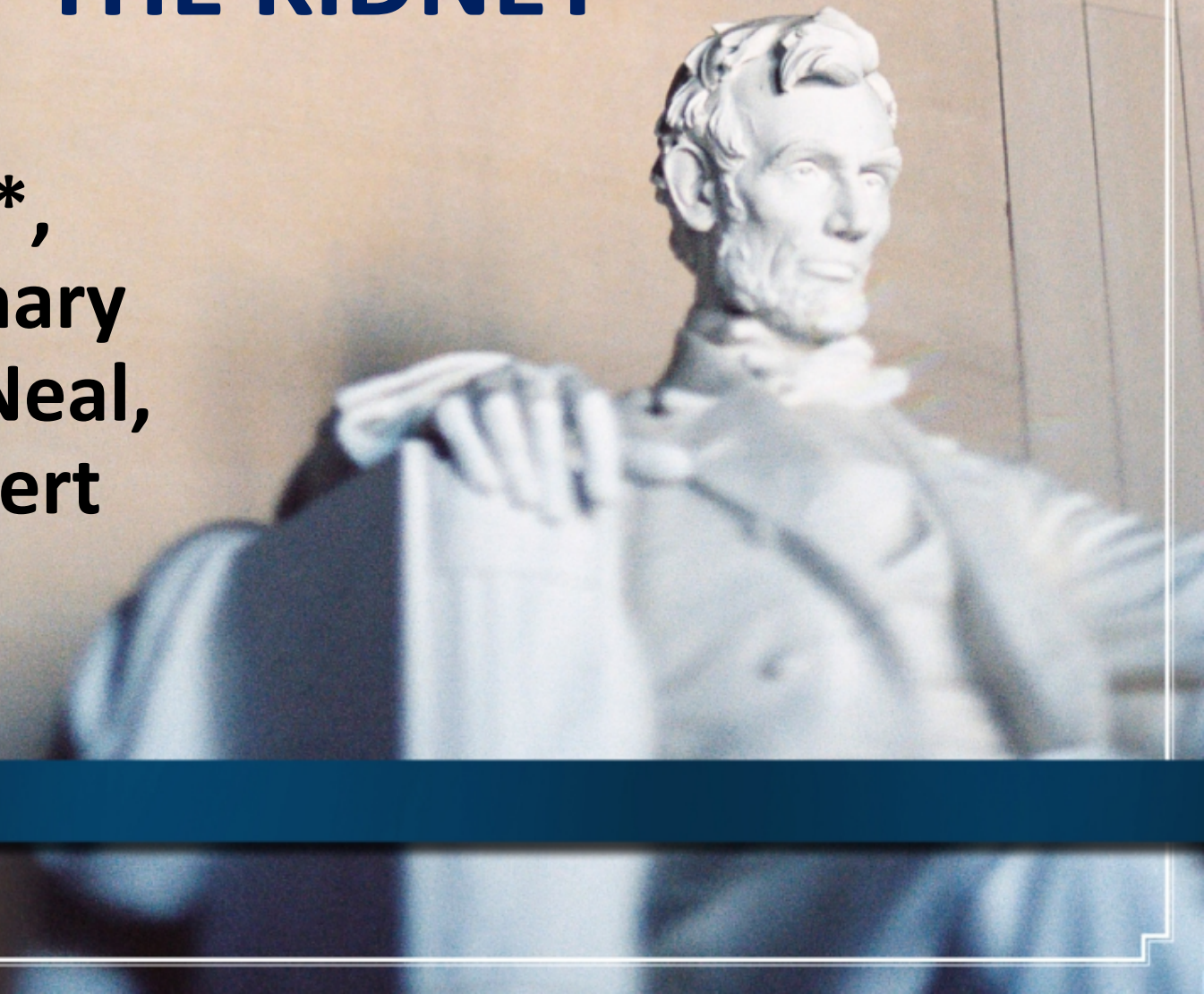


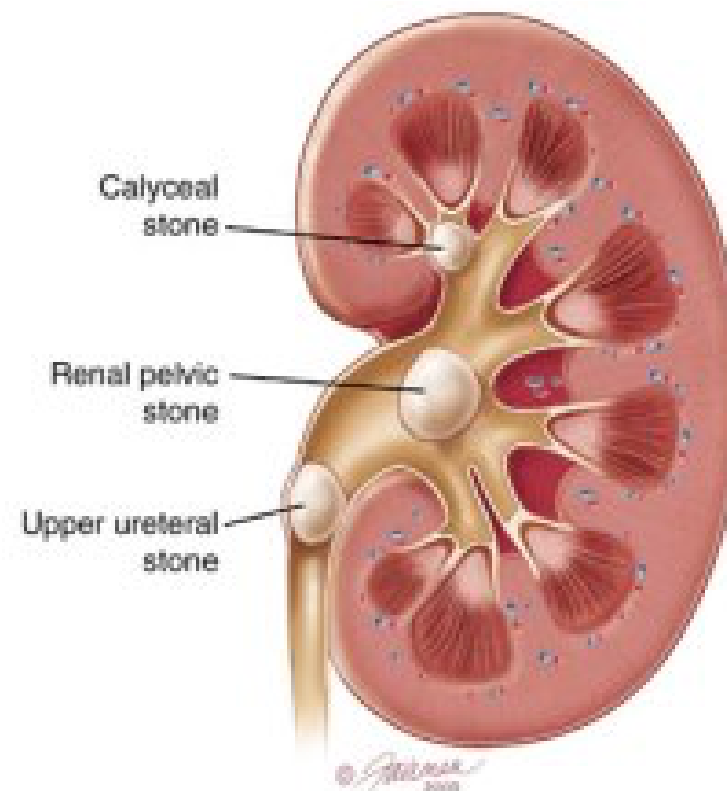
FR01-14 RANDALL'S PLAQUES: A MYSTERY OF THE KIDNEY

**Soum D. Lokeshwar*,
Thomas E. Dykes, Zachary
Klaassen, Durwood E. Neal,
Martha K. Terris, Robert
Marcovich**

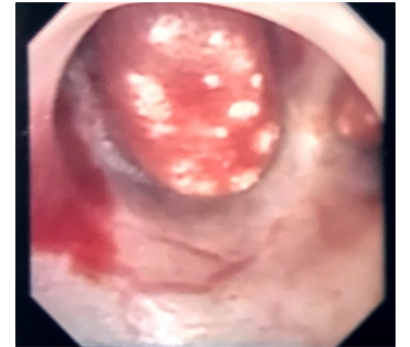
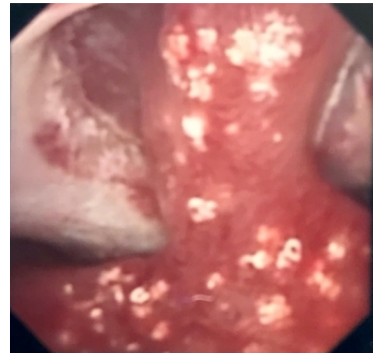
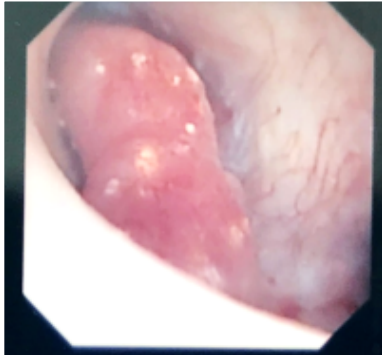


A Case of Nephrolithiasis

- **32 y/o Male with a h/o recurrent bilateral nephrolithiasis**
- **Came in for bilateral ureteroscopy with laser lithotripsy and stent exchange, cystoscopy and fluoroscopy**



A Curious Discovery



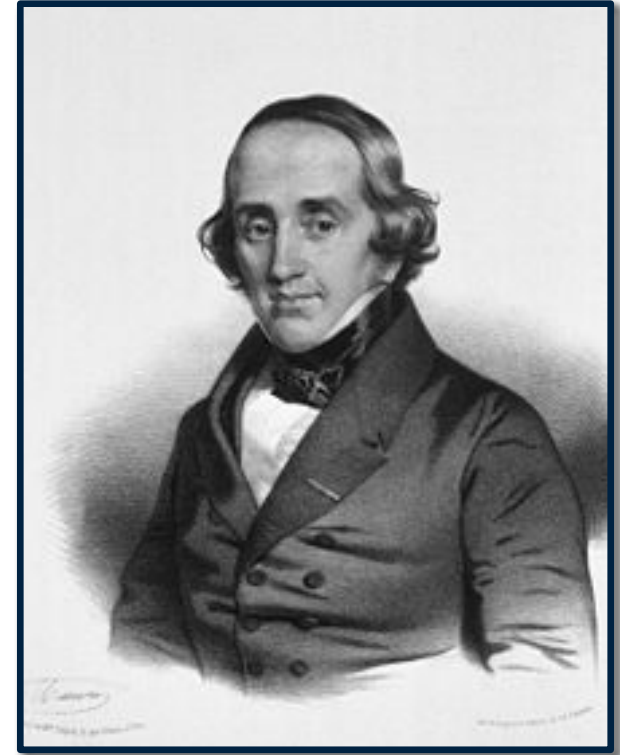
History

- **600 BC**

- *A vegetarian diet, a urethral syringe of medicated milk, clarified butter, and alkalis*

- **1832 AD**

- Jean Civale invents the lithotrite
- Mortality fell from >18% to “2.2%”

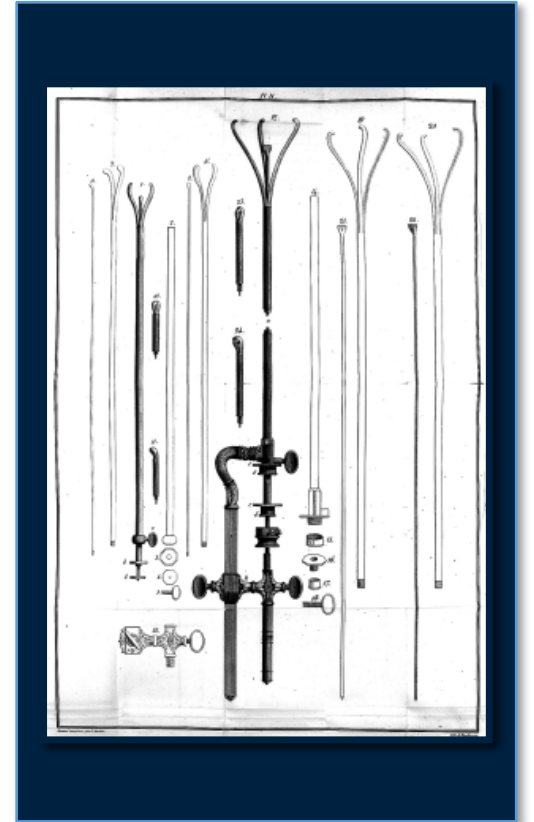


History



Alexander Randall

- Born on April 18, 1883 in Annapolis Maryland, US
- Medical training Johns Hopkins University 1907
 - Private assistant to Dr. H. Young in 1910
- 1917-1919 Major in the Medical Corps, US Army
- Professor University of Pennsylvania
- **AUA President 1932**



Landmark Study

- Rejected isolated prior theories of Infection, Vitamin A deficiency, Parathyroid Hyperfunction

THE ORIGIN AND GROWTH OF RENAL CALCULI

ALEXANDER RANDALL, M.D.

PHILADELPHIA, PA.

- 1937 Annals of Surgery



Randall's Plaques

- *That there must be an initiating lesion that precedes the formation of a renal calculus*
- *That the initiating lesion was to be looked for on the renal papilla*
- **Examined 430 pairs of kidneys – 17% showed plaques**
 - *On microscopic study, the lesion was found to be a plaque of Calcium deposited in the interstitial tissue of the renal papilla, and definitely not intratubular.*



Current Understanding

- **Randall's Plaques**

- Sub-epithelial deposits of CaP crystals
- Basement membrane of the loops of Henle
- Basement membrane of the vasa recta

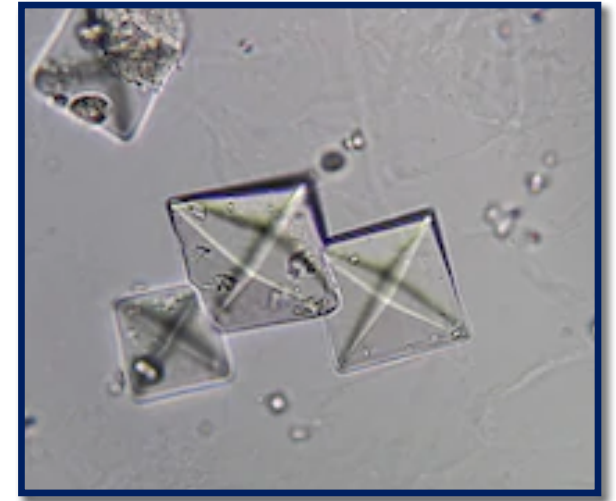
- **Randall's Plugs**

- Occlusion of the openings of the Ducts of Bellini
- renal tubular injury and focal inflammation
- supersaturation of precipitating salt



Associations with Randall's Plaques

- **Plaque at papillary surface linked to:**
 - Kidney stone number
 - Low urine volume
 - Low urine pH
 - High urinary calcium
 - Tubular plugging
- Present in most **iCaOx SF**
 - Higher the surface area the more severe disease

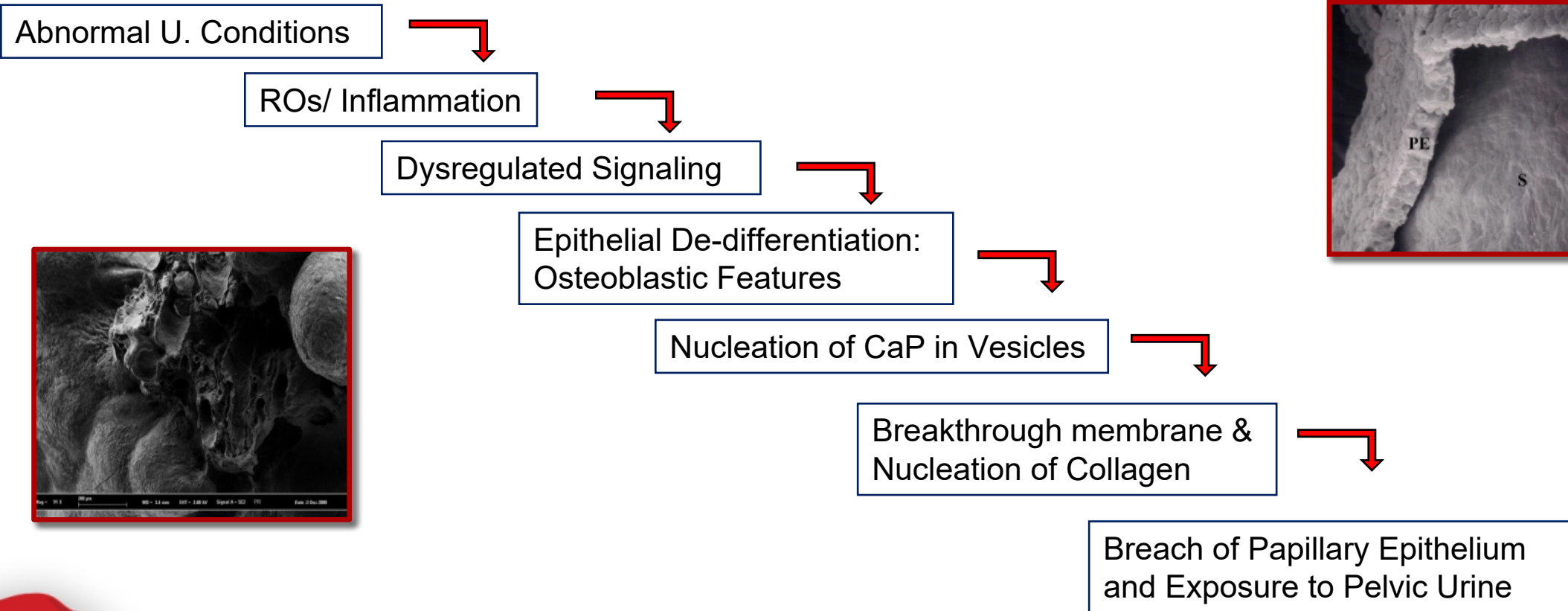


Legacy

- Died November 18, 1951
- Survived by his wife Edith and his 4 children
- However his legacy lives on



A Unified Theory on Pathogenesis



Continued Burden

- **Incidence**

- 1988-1994: 5.2%
- 2007-2010: **8.4%**
 - Men: 10.6%
 - Women 7.1%

- **Cost of Disease**

- 2000: \$2 billion
- 2006: \$10 billion
- MET with tamsulosin: **\$1132** cost advantage over observation
- Still only reduce recurrence **30-50%**



Risk of Cancer

- **Netherlands Cohort Study**

- 120,000 participants aged 55 – 69
- Urinary Calculi ↑ risk of papillary RCC (HR:3.08) & UTUC (HR: 1.66)

- **Taiwan National Health Insurance Research Database**

- 43,516 participants from 2000 – 2009
- Urinary Calculi ↑ risk of Kidney, Bladder, Breast, hematologic etc.

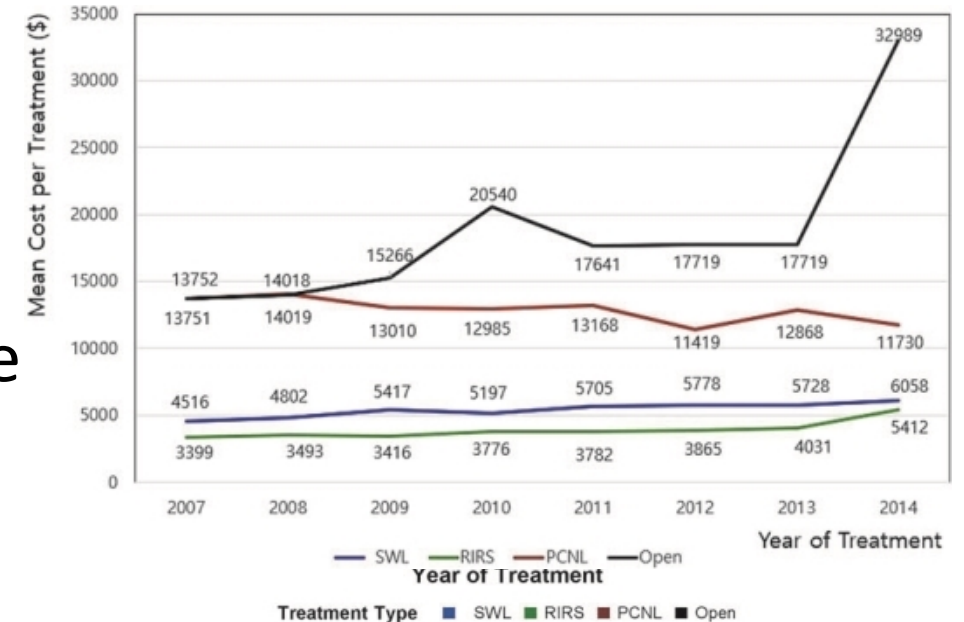
- **Meta-analysis**

- - 7 studies and 63,000 KS participants
- - Pooled RR of RCC = **1.76**
- - Pooled RR of TCC = **2.14**



Changing Landscape

- **2007 – 2014 United States**
- 1.4 million patients diagnosed with nephrolithiasis
 - 68,000 received Surgical treatment intervention
- Decreasing Trend for SWL and an increase for RIRS. PCNL remained steady
- Cost: RIRS < SWL < PCNL < Open Surgery



Acknowledgements

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3. The History of Urinary Stones: In Parrallel with Civilization – Tefekli, A 2013
4. Randall's plaque: pathogenesis and role in calcium oxalate nephrolithiasis – Evan, A 2006
5. Characterization of Inner Medullary Collecting Duct Plug Formation Among Idiopathic Calcium Oxalate Stone Former – Rivera M 2016
6. A Proposed Grading System to Standardize the Description of Renal Papillary Appearance at the Time of Endoscopy in Patients with Nephrolithiasis – Borofsky, M – 2016
7. Randall's plaque and kidney stones: Recent advances and future challenges – Letavernier, E 2016
8. Demographics and Characterization of 10,282 Randall Plaque-Related Kidney Stones – Letavernier, E 2015
9. Endoscopic Evidence That Randall's Plaque is Associated with Surface Erosion of the Renal Papilla – Cohen, A 2017