

Detective Nephron

Detective Nephron, world-renowned for his expert analytic skills, trains budding physician-detectives in the diagnosis and treatment of kidney diseases. L. O. Henle, a budding nephrologist, presents a new case to the master consultant.



Nephron What do you have for us today, my dear apprentice?

Henle I have a 77-year-old white woman with a history of type 2 diabetes mellitus and recently diagnosed metastatic ovarian cancer and now acute kidney injury (AKI).

Nephron Stop... let's see what we can dissect from that.

Henle You will be all over this!

Nephron Not another onconephrology case, Henle; let's do some basic nephrology.

Henle Hmm. Actually, it really isn't. She hasn't yet received any chemotherapy or immunotherapy. Not even radiation. She was in the process of starting but hasn't yet. Her serum creatinine is 7 mg/dL, and her BUN is 110 mg/dL.

Nephron (*with awe*): What?

Henle Yes, and her serum creatinine was 0.7 mg/dL 1 year ago and 1.2 mg/dL 6 months ago, and just 1.3 mg/dL 2 weeks ago.

Nephron (*angry*): What?

Henle (*surprised*): There you go again—you are stealing my thunder. Yes, and a Foley catheter was placed, but with no urine output.

Nephron Is there any hematuria?

Henle (*rolling his eyes*): Not really; she is not making any urine, so we can't assess for proteinuria or hematuria.

Nephron I am sure they did serologies before they called you.

Henle Yes, so far: antinuclear antibody (ANA), C3, C4, ANCA, double-stranded DNA, and anti-glomerular basement membrane all are negative. She has a negative serum immunofixation, and her serum free light chain ratio was 2.

Nephron Stop right there. Before we go any further, let me summarize this. You have an older lady with recently diagnosed ovarian cancer with a rapidly rising serum creatinine.

Henle (*wondering to himself about quick decision by Nephron*): Yes; correct. By the way, she is not on any medications. No herbal agents, no proton pump inhibitors or nonsteroidal anti-inflammatory drugs—and her complete blood count is normal, making your favorite diagnosis of thrombotic microangiopathy less likely.

Nephron Oh! Oh! No! This is a good one! Glad you brought this one to me. Anuric kidney failure has very few causes. The top three are usually hydronephrosis, hydronephrosis, and hydronephrosis!

Henle (*trying to remember*): Haha... perhaps not. The renal sonogram—sorry, kidney sonogram—was negative for hydronephrosis.

Nephron (*jumping in*): Really....

Henle Hmm. You are too much! Stop interrupting. I even did a CT scan to see if there was something I was missing. There is significant retroperitoneal metastatic disease, and it seems worse than the prior scan 1 month ago.

Nephron (*shocked*): This is impressive! What are her electrolytes?

Henle Serum sodium is low at 125 mmol/L, and serum potassium is high at 5.8 mmol/L. And she has acidemia, with CO₂ at 18 mm Hg.

Nephron Of course, they are...

Henle (*not sure*): This is probably acute tubular injury or acute interstitial nephritis. What else could this be?

Nephron Hmm. From what? Was there any hypotension, new medications... contrast material... any other insults?

Henle (*confused*): No to all.

Nephron (*interrupting*): Is there anything on her physical examination?

Henle Some abdominal distention, and 1+ edema in her lower extremities.

Nephron (*confident*): This is hydronephrosis.

Henle No, the sonogram and CT scan were negative for hydronephrosis.

Nephron Smells like a hydronephrosis to me. This is hydronephrosis.

Henle (*puzzled*): OK... but how can you have hydronephrosis without imaging findings?

Nephron The sonogram reads no hydronephrosis and/or dilation. But clinically, the only thing that makes sense to me is obstruction. Especially with the electrolyte findings and this sudden rise of serum creatinine in the setting of a retroperitoneal mass. Nondilated obstruction is not uncommon, especially in patients with cancer that affects the retroperitoneal regions. There is so much disease that there is no room for the kidney to expand. But that does not mean that hydronephrosis is not present. The syndrome of nondilated obstructive uropathy and AKI is well reported in that setting, although the literature suggests that this syndrome is rare, accounting for fewer than 5% of cases of urinary obstruction.

Henle's eyes respond with shock.

Henle Really? You must be kidding!

Nephron One of the earlier studies looked at a series of patients at a single center and found that the most common cause of nondilated hydronephrosis was cancer (likely related to retroperitoneal disease): prostate, colon, bladder, cervical, ovarian, lymphomas. Antegrade urography can help. The first-ever case of this was described in 1948 in someone with retroperitoneal fibrosis.

Henle, puzzled, leaves the room but returns in 2 days.

Nephron And?

Henle (*with a smile*): We asked radiology to place percutaneous nephrostomy tubes, and there was significant bilateral obstruction. The patient's serum creatinine is improving. Her electrolytes have improved as well.

Nephron (*jumping in*): Despite the absence of dilation on renal imaging, a strong suspicion for nondilated obstructive uropathy led to decompression procedures with prompt recovery of kidney function in your patient. This has been reported in the radiology literature. It is an important differential diagnosis to consider. Treatment is usually diagnostic. Given the pathologic features, the ureteral stents sometimes get restenosed and are unable to adequately decompress the collecting system. Percutaneous nephrostomy is usually the best procedure in such situations. Educating our urology and radiology colleagues about this entity is extremely important.

Henle (*surprised*): This is just fascinating and so refreshing. I love nephrology.

Nephron Hyponatremia and hyperkalemia have been reported with hydronephrosis as a result of the effect on the Na⁺-2Cl⁻-K⁺ channels and Na⁺-K⁺-ATPase pump being downregulated. The AKI itself can be responsible for these rapid electrolyte disorders from the hydronephrosis.

Nephron Well done, apprentice. Keep an open mind. Again, never assume. Anuric AKI has very few causes: hydronephrosis, hydronephrosis, and then perhaps acute tubular injury, acute interstitial nephritis, and then cortical necrosis. Again, a quick diagnosis here and a therapeutic procedure saved this patient's kidneys!

Henle (*laughing*): I need some coffee—the super New York style.

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