

INTRODUCTION:

Medullary sponge kidney is a benign congenital condition that affects about 1/5000 people. In this abnormal formation there is cystic dilation of the renal medullary and papillary parts of the collecting ducts (Garfield, 2022). The cysts which contain clear fluid can be anywhere from 1 to 8 millimeters in size. The name “sponge” comes from how the kidney appears when cut in half. In 70% of cases, the condition is bilateral (Garfield, 2022). Most cases are sporadic. Women are more prone to be born with it than men. Medullary sponge kidney is often discovered anytime between the teen years and 30’s. Patients, although asymptomatic mostly, can present with hematuria, UTI, and nephrolithiasis especially nephrocalcinosis (Garfield, 2022).

Extended spectrum beta lactamase (ESBL) is an enzyme that drives the formation of some antibiotic resistant bacteria. The enzyme can hydrolyze many common antibiotics and some bacteria are able to transfer ESBL to other bacteria via plasmids. ESBL most commonly affects *Escherichia coli* and *Klebsiella* species (Kayastha, 2020).

CASE:

A 31-year-old female patient presents to the emergency department with left sided flank pain. She states the pain radiates through the left side of her abdomen. Patient also complains of dysuria but states it is a chronic issue. At the time of admission, patient denied fevers, chills, chest pain, shortness of breath, nausea, vomiting and diarrhea. Prior to this hospitalization, patient had a stent removal 3 days before due to nephrolithiasis. Past medical history is significant for medullary sponge kidney, recurrent nephrolithiasis, type 1 renal tubular acidosis, and prior opioid use. Patient also has longstanding ESBL colonization for which she was previously given meropenem for. She has had several urologic procedures done in the past due to her past medical history. On exam, her vital signs are stable, and patient is in no acute distress. She is alert and orientated x4. Left sided tenderness was not elicited.

CBC (see figure 1)

BMP (see figure 2)

UA: Packed WBC present, 30-50 RBC, Protein: 100, Appearance: cloudy

Ultrasound: marked hydronephrosis in the left kidney.

CT scan: shows 2 mm stone in left ureter with multiple stone fragments.

Significant hydronephrosis is appreciated in left kidney.

Figure 1.
CBC: Pertinent values

Test	Day 1 (Day of admission)	Day 4 (Day of Discharge)
WBC (10x3/uL)	16.8	7.8
RBC (10x6/uL)	4.38	3.41
Hgb (G/DL)	11.9	9.2
Hct (%)	36.3	28.6
MCV (FL)	82.9	83.8
MCH (PG)	27.2	26.9
MCHC (G/DL)	32.8	32.0
Platelet	312	289
RDW (%)	15.9	15.5
Auto Neutrophils (%)	86.7	62.3
Auto Lymph (%)	5.9	30.9
Absolute Neutrophils (10x3/uL)	14.60	4.90

Figure 2.
Basic Metabolic Panel: Pertinent values

Test	Day 1 (Day of admission)	Day 4 (Day of Discharge)
Na (mmol/L)	136	141
K (mmol/L)	3.8	3.7
Cl (mmol/L)	113	118
Carbon Dioxide (mmol/L)	16	18
BUN (mg/dL)	20	12
Creatinine (mg/dL)	1.6	1.4
Anion Gap:	7	5



Figure 3: Non- contrast CT: Kidney



Figure 4: Renal Ultrasound: Left Kidney

DISCUSSION:

The patient was officially diagnosed with complicated urinary tract infection and nephrolithiasis secondary to medullary sponge kidney. Two consults were made to urology and infectious diseases. A plan to perform a left retrograde and stent insertion was made as well as following the infection closely. A midline was placed for an antibiotic infusion of ertapenem 1000 mg for 9 days. Ertapenem works via inhibiting bacterial cell wall formation by binding to penicillin binding proteins and is one of the few antibiotics with coverage against ESBL bacteria. Follow-up appointments for the urology and infectious disease were made.

Indications for stent placement: This patient has had several stent placements and removals but is not a candidate for a permanent stent due to reoccurring infections. Stents are used to help urinary drainage that may be obstructed due to reoccurring stones and hydronephrosis (Beysens, 2018). During this hospital stay a stent was placed in the left kidney which will be removed later once the infection resides. According to this patient’s white blood count and absolute neutrophil count upon discharge, the infection may have started to reside.

Patients with ESBL in their urine are placed on a contact isolation protocol to prevent transmission to healthcare workers and other patients. Using gloves and proper decontamination of hands and surfaces is important to prevent transmission (Rupp, 2003). Out of all bacteria, *Escherichia coli* and *Klebsiella* species reign highest as causative pathogens in infections found (Rupp, 2003). ESBL are class A beta lactamases that cause resistance via hydrolyzing antibiotics. AmpC beta lactamases specifically can also be transferred via plasmids to other bacteria increasing resistance (Rupp, 2003). This poses an issue because the typical antibiotics used to treat infections such as tetracyclines, β-lactams, fluoroquinolones, aminoglycosides can show resistance. If bacterial isolates show resistance to at least three or more antibiotics, the patient will have a multi drug resistance ESBL bacteria (Rupp, 2003). Carbapenems are maintained as the drug of choice for these types of infections however there is always a concern for carbapenem resistance to emerge.

This patient is a former opioid user who is in recovery and doing well on a suboxone treatment. The use of midlines and PICC lines is controversial in former drug users however it is up to the discretion of the medical team. Currently, there is no contraindication in using a midline in a recovering patient. This patient has been compliant with previous IV infusions and has continued suboxone. Future studies focusing on use of PICC and mid lines in former IV drug users can be researched to help set clear guidelines and ensure patient safety.

CONCLUSION:

Medullary sponge kidney while rare and mostly asymptomatic can create persistent issues even with proper medical care. Risk of reoccurring infection and nephrolithiasis are important to consider due to increased risk of damage on the kidneys (Vaidya, 2021). ESBL infections makes treating with typical antibiotics difficult and risk of increased resistance is present. Untreated infections carry a risk of sepsis which would complicate the primary issue further. This patient will need to continuously follow up with urology and a primary care physician because of the congenital condition and aggressive antibiotic therapy needed.

References:

Beysens, M., & Taillly, T. O. (2018). Ureteral stents in urolithiasis. *Asian journal of urology*, 5(4), 274–286. <https://doi.org/10.1016/j.ajur.2018.07.002>

Garfield K, Leslie SW. Medullary Sponge Kidney. [Updated 2022 Feb 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK470220/>

Kayastha, K., Dhungel, B., Karki, S., Adhikari, B., Banjara, M. R., Rijal, K. R., & Ghimire, P. (2020). Extended-Spectrum β-Lactamase-Producing *Escherichia coli* and *Klebsiella* Species in Pediatric Patients Visiting International Friendship Children's Hospital, Kathmandu, Nepal. *Infectious diseases*, 13, 1178633720909798. <https://doi.org/10.1177/1178633720909798>

Rupp, M. E., & Fey, P. D. (2003). Extended spectrum beta-lactamase (ESBL)-producing Enterobacteriaceae: considerations for diagnosis, prevention and drug treatment. *Drugs*, 63(4), 353–365. <https://doi.org/10.2165/00003495-200363040-00002>

U.S. Department of Health and Human Services. (2015, August). *Medullary Sponge Kidney*. National Institute of Diabetes and Digestive and Kidney Diseases. Retrieved January 26, 2022, from <https://www.niddk.nih.gov/health-information/kidney-disease/children/medullary-sponge-kidney>

Vaidya SR, Yarrarapu SNS, Aeddula NR. Nephrocalcinosis. [Updated 2021 Aug 13]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK537205/>