JOINT UROLOGY CONFERENCE

EMPHYSEMATOUS PYELONEPHRITIS

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MODERATOR
OBJECTIVES

• To discuss the risk factors, pathophysiology and clinical features of emphysematous pyelonephritis

• To present the diagnostic, prognostic and therapeutic approach to patients with emphysematous pyelonephritis
PATIENT PROFILE

• P.G.
• 68-year-old
• Male
• Admitted for the first time last April 5, 2016
• The patient is a known hypertensive and non-diabetic with frequent consults at NKTI OPD due to recurrent urinary tract infection

• He was diagnosed with benign prostatic hyperplasia last 2014 and was maintained on foley catheter

• Chief Complaint: Turbid urine
HISTORY OF PRESENT ILLNESS

- Turbid urine
- Generalized body weakness & anorexia

Foley catheter change

2 days

Consult
PAST MEDICAL HISTORY

• **Hypertension** > 20 years, maintained on Amlodipine 10 mg OD and Metoprolol 50 mg BID, usual BP 140/80 mmHg, highest BP 150/90 mmHg

• **Benign prostatic hyperplasia** (2014), maintained on foley catheter

• **Chronic kidney disease stage IV secondary to hypertensive nephrosclerosis / obstructive uropathy**, usual creatinine 3.8 mg/dL (eGFR 15.10 ml/min./1.73 m²), highest creatinine 5.3 mg/dL (eGFR 10.32 ml/min./1.73 m²), maintained on Ferrous Sulfate 325 mg TID, Folic Acid 5 mg OD and Sodium Bicarbonate 650 mg TID
• **Family History**
  • Unremarkable

• **Social History**
  • Previous 5 pack year smoker and occasional alcoholic beverage drinker
  • Denies illicit drug use
  • No intake of herbal medications or frequent use of NSAIDs
# REVIEW OF SYSTEMS

<table>
<thead>
<tr>
<th>System</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>(-) Sweating, (-) weight gain, (-) weakness</td>
</tr>
<tr>
<td>Skin</td>
<td>(-) Itching, (-) rashes, (-) changes in hair/nails</td>
</tr>
<tr>
<td>Eyes</td>
<td>(-) Visual impairment, (-) redness, (-) tearing, (-) pain, (-) double vision, (-) discharge</td>
</tr>
<tr>
<td>Ears</td>
<td>(-) Hearing, (-) pain, (-) discharge, (-) tinnitus</td>
</tr>
<tr>
<td>Nose, Throat, Mouth</td>
<td>(-) Hoarseness, (-) sore throat, (-) trauma, (-) frequent colds, (-) nose bleeding, (-) neck mass, (-) dental carries, (-) facial pain, (-) sinus disorder, (-) gum Bleeding, (-) toothache</td>
</tr>
<tr>
<td>Respiratory</td>
<td>(-) Cough, (-) hemoptysis</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>(-) Chest pain, (-) palpitation, (-) syncope</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>(-) Dysphagia, (-) nausea, (-) vomiting, (-) change in appetite, (-) abdominal pain, (-) melena, (-) jaundice, (-) bleeding, (-) indigestion, (-) heartburn, (-) hematemesis, (-) fatty food intolerance, (-) stool frequency/character, (-) hemorrhoids, (-) hernia</td>
</tr>
<tr>
<td>Urinary</td>
<td>(-) Dysuria, (-) retention, (+) bleeding, (-) stream, (-) nocturia, (-) stones, (-) hesitancy, (-) urgency, (-) change in color, (-) frequency, (-) dribbling</td>
</tr>
</tbody>
</table>
# REVIEW OF SYSTEMS

<table>
<thead>
<tr>
<th>System</th>
<th>Abnormalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genito- Reproductive</td>
<td>(-) Discharge, (-) pain, (-) libido, (-) sexual difficulties</td>
</tr>
<tr>
<td>Breast</td>
<td>(-) Nipples, (-) lump, (-) pain, (-) discharge</td>
</tr>
<tr>
<td>Extremities</td>
<td>(-) Cyanosis, (-) clubbing, (-) varicosity, (-) ulcers, (-) claudication</td>
</tr>
<tr>
<td>Hematopoietic System</td>
<td>(-) Excessive bleeding/bruising, (-) pica</td>
</tr>
<tr>
<td>Nervous System</td>
<td>(-) Headache, (-) tremor, (-) fainting spells, (-) seizures, (-) neurological deficit, (-) gait disturbance, (-) dizziness/vertigo, (-) head trauma, (-) sensory perversions</td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>(-) Joint pain or stiffness, (-) muscle weakness</td>
</tr>
<tr>
<td>Endocrine System</td>
<td>(-) Heat/cold intolerance, (-) thyroid problems, (-) neck surgery/irradiation, (-) proximal muscle weakness, (-) easy bruisability</td>
</tr>
<tr>
<td>Psychiatric</td>
<td>(-) Mood swings, (-) behavioural changes, (-) anxiety, (-) depression</td>
</tr>
</tbody>
</table>
# PHYSICAL EXAMINATION

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gen. Survey</td>
<td>Awake, coherent, ambulatory, not in distress</td>
</tr>
<tr>
<td>Vital Signs</td>
<td>BP: 120/80 mmHg, HR: 82 bpm, RR: 20 cpm, Temp.: 37.1°C</td>
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<tr>
<td>HEENT</td>
<td>Anicteric sclera, pink palpebral conjunctiva, no tonsillopharyngeal congestion, no cervical lymphadenopathies, non-distended neck veins</td>
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<tr>
<td>Chest/Lungs</td>
<td>Equal chest expansion, clear breath sounds, no wheezing</td>
</tr>
<tr>
<td>Heart</td>
<td>Adynamic precordium, normal rate, regular rhythm, PMI at 4th intercostal space, left mid clavicular line, no murmur</td>
</tr>
<tr>
<td>Abdomen</td>
<td>Globular, normoactive bowel sounds, soft, no tenderness, no CVA tenderness, no masses</td>
</tr>
<tr>
<td>Extremities</td>
<td>Full and equal pulses, no edema, no cyanosis</td>
</tr>
</tbody>
</table>
SALIENT FEATURES

• 68-year-old
• Male
• Hypertensive
• Non-diabetic
• CKD 2 HPNNS / OU
• Recurrent urinary tract infection

• BPH on chronic foley catheter
• CC: Turbid urine
• BP 120/80 mmHg
• Afebrile
• No CVA tenderness
### INITIAL WORK-UPS

#### COMPLETE BLOOD COUNT
- **Hemoglobin**: 10.4 g/dL
- **Hematocrit**: 28.7%
- **WBC**: 18.76 x 10³/uL
- **Neutrophil**: 84.8%
- **Lymphocyte**: 7.8%
- **Monocyte**: 6.9%
- **Eosinophil**: 0.3%
- **Basophil**: 0.2%
- **Platelet**: 309 x 10³/uL

#### BLOOD CHEMISTRIES
- **Blood Urea Nitrogen**: 52 mg/dL
- **Creatinine**: 5.0 mg/dL
- **eGFR**: 10.96 ml/min./1.73 m²

#### URINALYSIS
- **Color**: Reddish Brown
- **Clarity**: Turbid
- **Specific Gravity**: 1.006
- **pH**: 6.0
- **Protein**: 3+
- **Glucose**: Negative
- **Blood**: 3+
- **Leukocyte Esterase**: 3+
- **WBC**: 257/hpf
- **RBC**: 1/hpf
- **Epithelial Cells**: 0/hpf
- **Hyaline Cast**: 3/hpf
- **Bacteria**: 14,127/hpf

#### LOWER ABDOMINAL ULTRASOUND
- Normal-sized right kidney with mild ureteropelvocaliectasia and parenchymal thinning
- Enlarged left kidney with moderate to severe hydronephrosis, debris and air, cannot rule out emphysematous pyelonephritis
- Cystitis and/or chronic bladder outlet obstruction with debris and intraluminal air
- Marked prostatomegaly 147 gm
PROBLEM LIST

1. Catheter-associated UTI
2. Emphysematous pyelonephritis, left
3. BPH, in retention
4. AKI (infection) on top of CKD 2 to HPNNS / OU
5. Hypertension, controlled
6. Anemia of chronic disease

- Treat infection
- Relieve obstruction
- Percutaneous catheter drainage and/or nephrectomy?
- Monitor renal function
- Supportive therapy
EMPHYSEMATOUS PYELONEPHRITIS

- Gas-producing, necrotizing infection involving the renal parenchyma and, in some cases, perirenal tissue
- Escherichia coli or Klebsiella pneumoniae
- Candida is a rare cause

RISK FACTORS

Urinary calculi, bladder and ureteral obstruction.

- Tissue glucose levels:
  - Increase
- Tissue perfusion:
  - Decrease
- Pelvocaliceal pressure:
  - Increase

Transitional cell carcinoma, Hinman syndrome, obstructive uropathy, and papillary necrosis.

60 years old: 6:1

- Diabetes Mellitus
- Urinary Tract Obstruction
- Elderly
- Women

PATHOGENESIS

E. coli, Klebsiella spp. and Proteus spp. are gram-negative facultative anaerobic organisms, which ferment glucose and lactate to carbon dioxide causing necrotizing infection in an appropriate tissue environment.

CLINICAL FEATURES

Acute
- Fever & Chills
- Nausea / Vomiting
- Flank / Abdominal Pain

Insidious

**DIAGNOSIS**

DIAGNOSIS

Hyperglycemia  Azotemia
Leukocytosis  Bacteremia
Pyuria  Acute Renal Failure

DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

- Severe Acute / Xanthogranulomatous Pyelonephritis
- Reflux of Air from the Bladder
- Entero / Cutaneo – Renal Fistula Formation
- Retroperitoneal Perforation of Abdominal Viscus
- Renal / Psoas Abscess
- Recent Urologic or Radiologic Intervention
PROGNOSTIC CLASSIFICATION

Type 1

- Renal parenchymal necrosis with either absence of fluid collection or the presence of a streaky or mottled gas pattern
- Vascular thrombosis
- Fulminant course
- Symptom onset to diagnosis (4 days)
- Higher mortality rate (69%)
- Necrosis and hemorrhagic infarction

Type 2

- Renal or perirenal fluid accompanied by a bubbly gas pattern or gas in the collecting system
- Symptom onset to diagnosis (11 days)
- Lower mortality rate (18%)
- Diffuse infiltration of inflammatory cells and abscess formation

PROGNOSTIC CLASSIFICATION

• **Class 1**: Gas in the **collecting system**, may be associated with severe obstruction
• **Class 2**: Gas in the **renal parenchyma** without extension to the extrarenal space
• **Class 3A**: Extension of gas or abscess to the **perinephric space**
• **Class 3B**: Extension of gas or abscess to the **pararenal space**
• **Class 4**: Bilateral emphysematous pyelonephritis or a **solitary functioning kidney** with emphysematous pyelonephritis

PROGNOSTIC CLASSIFICATION

The success rate with PCD and antibiotics was 85 percent in patients with no or one risk factor compared with 8 percent in patients with two or more risk factors.

- Thrombocytopenia
- Acute Renal Failure
- Impaired Consciousness
- Shock

TREATMENT

- Systemic Antibiotics
- Emergent / Delayed Nephrectomy
- Open / Percutaneous Catheter Drainage
- Correction of Reversible Precipitating Factors
- Supportive Care


1. Antibiotics +/- PCD (Abscess)
2. Antibiotics + PCD
3. Antibiotics + PCD +/− Nephrectomy (High Risk)
4. Antibiotics + PCD, Nephrectomy (Last Option)
GOING BACK TO THE PATIENT

CRO → CXM

Urine CS: K. pneumoniae, Streptococcus spp.

Urine CS: E. aggloomerans, E. Coli, Enterococcus spp.

Crea: 7.2 mg/dL

eGFR: 7.1 ml/min./1.73 m²

Albumin: 2.2 g/dL

NT CS: E. coli

Histopath: Aspergillus spp.

Nephrectomy AMB
SUMMARY

APPROACH TO PATIENTS

1. Antibiotics +/- PCD (Abscess)
2. Antibiotics + PCD
3. Antibiotics + PCD +/- Nephrectomy (High Risk)
4. Antibiotics + PCD, Nephrectomy (Last Option)
THANK YOU FOR LISTENING!