CLINICAL APPROACH TO THE PATIENT WITH OBSTRUCTIVE UROPATHY

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Objectives

• Classify urinary tract obstruction as a post renal process
• Review relevant upper and lower urinary tract anatomy
• Review common pathological processes that cause urinary obstruction.
• Briefly review urological interventions for urinary tract obstruction
• Understand the triphasic renal pathophysiology that occurs with urinary tract obstruction and threatens renal function.
• Understand the differences between acute and chronic urinary tract obstruction

FeNa is generally not helpful !!! Renal ultrasound is often the first test ordered
Renal Ultrasound

GFR

\[ \text{Filtration Pressure} = \Delta P - \Delta \pi \]

Diagram of kidney with labeled parts:
- A
- B
- C
- D
- E
- F
- G
- H
- I
Endoscopic view of the renal papillae
Causes of Obstruction

- Intraluminal
  - renal calculi
  - blood clots
  - sloughed renal papillae
  - urothelial tumors
  - Fungal ball
- Intramural (intrinsic)
  - UPJ obstruction
  - structural lesions
- Extramural
  - prostatic disease
  - gynecologic, colorectal or retroperitoneal malignancy

Intraluminal Obstruction – Ureteral stone
Laser treatment of kidney stones

https://www.youtube.com/watch?v=JbFq4TICjwo
Percutaneous kidney stone treatment
• https://www.youtube.com/watch?v=cnjXL9G2SG8

Sloughed Renal Papilla
• Diabetes
• Sickle Cell
• Pyelonephritis
• Phenacetin abuse

Intraluminal Obstruction – Ureteral tumor
IntraMURAL Obstruction

Ureteral Physiology

Ureteral Peristalsis
  - https://www.youtube.com/watch?v=8FCbHE6-e_8
Extramural Obstruction

- Crossing vessel to the lower pole of the kidney
- Prostatic disease – lower urinary tract obstruction
- Retroperitoneal malignant disease
- Idiopathic retroperitoneal fibrosis

Extramural Obstruction

ANTERIOR-POSTERIOR RELATIONSHIPS
Chronic Obstruction causes anatomic renal damage

Extramural Obstruction From Retroperitoneal Disease
Bilateral ureteral stents

Nephrostomy tubes

LOWER URINARY TRACT OBSTRUCTION
Laser treatment of Prostate Enlargement

- [http://www.youtube.com/watch?v=rZi4nebby8](http://www.youtube.com/watch?v=rZi4nebby8)

Urethral Stricture Disease

Urethral Stricture Disease
Clinical Definitions

- Hydronephrosis
  - dilatation of the pelvis and calyces

- Obstructive uropathy
  - structural impedance to the flow of urine anywhere along the tract

- Obstructive nephropathy
  - Functional damage and/or anatomic damage to the renal parenchyma that results from an obstruction of urine flow

Renal Functional Changes

Acute Obstruction - Triphasic Changes in:

- Renal Blood Flow
- Ureteral Pressure
- GFR
Renal Functional Changes

Unilateral Obstruction

Filtration Pressure = ΔP - Δπ
Unilateral Obstruction

- **Afferent Arteriolar Constriction**
  - Angiotensin 2 via RAA system
  - Endothelin and thromboxane A2

- **Shift of regional flow from outer to inner cortex**

- **Pressure continues to rise**
  - Efferent arteriolar vasoconstriction

- **Pressure declines to baseline by 24 hours**
  - Due to decrease in GFR

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BILATERAL OBSTRUCTION
Bilateral Obstruction

- Common etiologies
  - BPH (lower urinary tract)
  - Retroperitoneal disease (upper urinary tract)
- Distinct/additional/adjunctive pathophysiologic effects
- Tends to present with a chronic picture of kidney failure reflected in abnormal blood tests levels
- Remember unilateral obstruction presents with symptoms

Effect of Obstruction on Urinary Concentrating Ability

- Normal concentrating ability requires:
  - medullary interstitial gradient
  - water permeability in the collecting duct by ADH

Following release of BUO there is decreased expression of aquaporin channels which causes polyuria and impaired concentrating ability

Postobstructive Diuresis

- Marked polyuria can be seen after relief of BUO or obstruction of a solitary kidney
  - Physiologic – retained urea, sodium, water
    - Diuresis ends when fluid homeostasis achieved
  - Pathologic – impairment of concentrating ability or sodium reabsorption
    - downregulation of sodium transporters
    - loss of medullary interstitial solute gradient
    - poor response to ADH
Anatomic Renal Damage from Chronic Obstruction

REVIEW

Review - Obstructive Nephropathy

- Definition - when obstruction causes functional or anatomic renal damage
- Functional damage is the effect on GFR
- Renal damage from chronic obstruction
Review - Anatomy

- The course of the ureter as it relates to intraluminal obstruction by kidney stones
- The anterior and posterior relationships of the renal collecting system and vasculature
- Intramural structure of the ureter
- LOWER urinary tract obstruction in the male affects both renal units

Review - Acute versus Chronic

<table>
<thead>
<tr>
<th>Acute</th>
<th>Chronic</th>
</tr>
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<tbody>
<tr>
<td>Most often unilateral and stones are the most common</td>
<td>More likely to be bilateral from...</td>
</tr>
<tr>
<td>Common presentation is pain or infection and the creatinine may not affected because the other kidney is normal/compensating</td>
<td>Prostatic Disease</td>
</tr>
<tr>
<td>Effects on GFR may be reversible</td>
<td>Malignancies causing extramural obstruction</td>
</tr>
<tr>
<td></td>
<td>UPJ obstruction would be an example of unilateral</td>
</tr>
<tr>
<td></td>
<td>Common presentation is renal failure(elevated creatinine)</td>
</tr>
<tr>
<td></td>
<td>Post obstructive diuresis can be seen</td>
</tr>
<tr>
<td></td>
<td>Renal ANATOMIC damage is not reversible</td>
</tr>
</tbody>
</table>

THANK YOU