

Difference Between Cystitis and Pyelonephritis

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Key Difference – Cystitis vs Pyelonephritis

Infections involving the kidneys, ureter, bladder, and urethra are known as the urinary tract infections. These infections are caused by various microbes that gain access to the urinary tract by different methods. According to the anatomical region of the urinary tract affected UTIs are classified into two broad categories as, lower tract infections and upper tract infections. **Pyelonephritis, which is the infection and associated inflammation of the kidney, falls under the upper urinary tract infections.** On the other hand, **infection of the bladder which is called the cystitis is classified under the lower urinary tract infections.** This is the key difference between cystitis and pyelonephritis. These two conditions vary in several aspects such as the anatomical site involved, etiology, pathogenesis, and management.

What is Pyelonephritis?

Pyelonephritis is the suppurative inflammation of the kidney and renal pelvis that is caused by bacterial infection. Enteric gram negative bacilli are the main causative agents of pyelonephritis. Among them, E. coli is the most commonly isolated pathogen. *Proteus*, *Klebsiella*, *Enterobacter*, and *Pseudomonas* are the other important organisms that are known to cause pyelonephritis. *Staphylococcus* and *Streptococcus faecalis* also can give rise to this condition.

Pathogenesis

The entry of bacteria into the renal parenchyma can happen in two ways.

- From the lower urinary tract as an ascending infection

This is the commonest route followed by the pathogens to enter the kidneys. Upon reaching the urinary tract they adhere to the mucosal surface and get colonized in the distal urethra. Then they gradually ascend up and invade the kidneys. Virulence factors such as fimbriae, aerobactin, hemolysin, and flagella play a key role in this process.

- Via blood

Hematogenous spread of the bacteria into the kidneys is frequently associated with septicemia and infective **endocarditis**.

The close proximity of the urethra to the anus makes women more prone to get pyelonephritis. The presence of a short urethra and the damage to the mucosal layers during sexual intercourse are the other factors that increase this vulnerability.

Pyelonephritis is also common among patients with urinary tract obstructions because of the stasis of urine that assists the colonization of bacteria in the bladder.

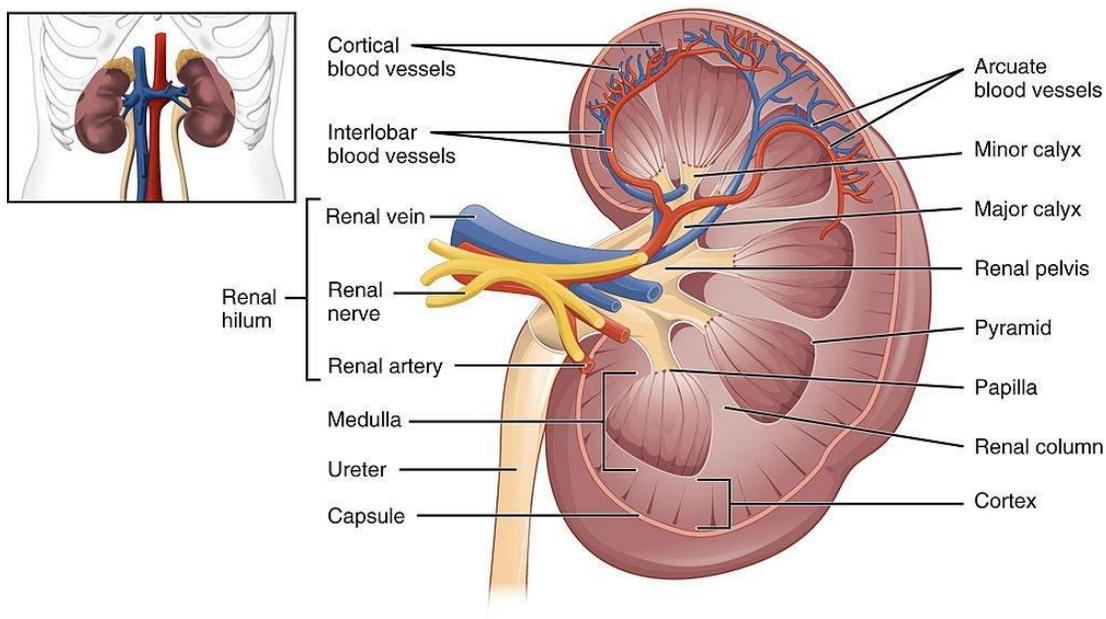


Figure 01: Kidney

Morphology

- The affected kidney is usually enlarged.
- One or both kidneys can be affected.
- Discrete, yellowish, raised **abscesses** are found on the renal surface.
- Liquefactive necrosis with abscess formation is seen within the renal **parenchyma**.
- Accumulation of **neutrophils** in the collecting ducts gives rise to white cell casts found in urine.
- Papillary **necrosis** may occur.

Signs and Symptoms

Symptoms: Loin pain, High fever with chills and vomiting

Signs: Renal angle and lumbar region tenderness

Predisposing Factors

- Urinary tract obstruction
- Vesicoureteric reflux
- Instrumentation
- [Diabetes mellitus](#)
- Female gender and old age
- Pregnancy
- Pre-existing renal lesions
- Immunosuppression

Diagnosis

Uncomplicated pyelonephritis can be diagnosed clinically.

Usually, a Urine Full Report(UFR) is taken. Confirmation of the diagnosis is based on the presence of pus cells, RBC or pus cell casts in urine. A urine culture can be done to identify the colonizing organism. The presence of a pure growth of more than 10^5 colonies per milliliter of fresh urine is considered as significant. Antibiotic sensitivity testing should be done in order to select the appropriate antibiotic treatment.

Other investigations that are usually done in the clinical set up are;

- Full Blood Count(FBC)
- Blood urea
- Serum electrolyte
- Blood culture and ABST
- FBS

Treatments

Intravenous antibiotics – Ciprofloxacin

Ceftazidime/ Ceftriaxone

Ampicillin+ Clavulanic acid

What is Cystitis?

Cystitis is the inflammation of the bladder. [Bacterial infections](#) are the commonest cause of cystitis. This condition can be painful and may give rise to many serious complications if the infection spreads to the kidney. The severity and the course of the disease depend on the virulence of the organisms.

Women usually get uncomplicated cystitis after the first sexual intercourse. In medicine, this condition is given a peculiar name as the “honeymoon cystitis”.

Commensals of the gastro intestinal tract are the culprits responsible for most cystitis cases. They enter the urinary tract from the perianal region and get colonized in the bladder giving rise to the clinical manifestations

Long standing cystitis is associated with hypertrophy of the bladder and the trabeculation of the bladder wall.

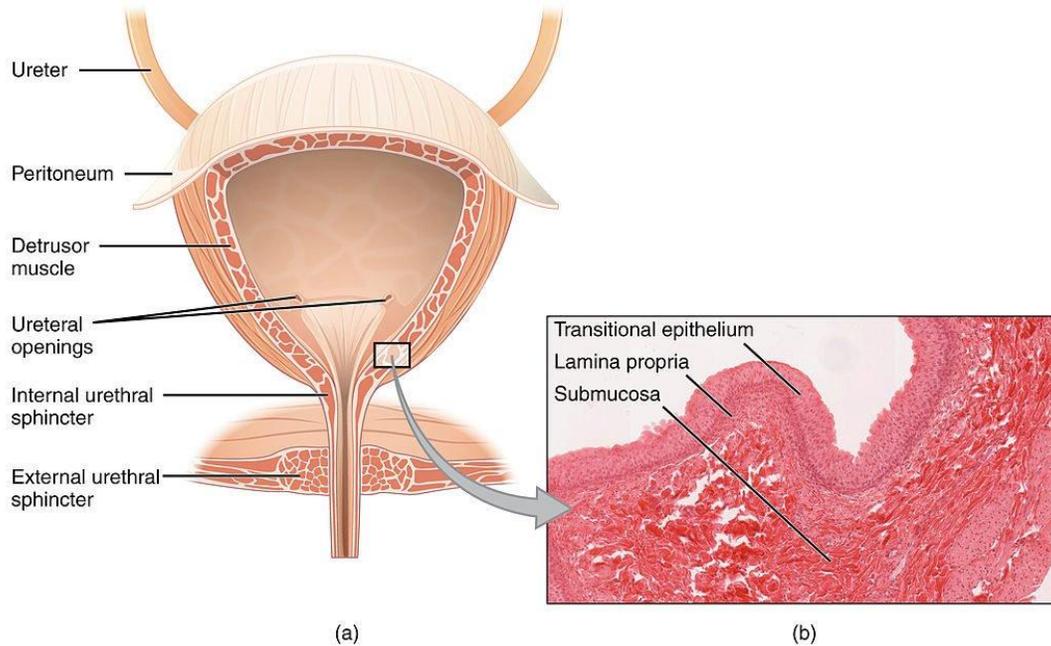


Figure 02: Bladder

Signs and Symptoms

Symptoms: Dysuria, increased frequency of micturition, supra pubic pain

Signs: Supra pubic tenderness

Diagnosis

Most of the time diagnosis of cystitis is based on the symptoms and signs. Confirmation of the infection can be done by UFR or dipstick. If necessary a urine culture can be done to identify the colonized organism.

Treatment

Oral antibiotics can be given for 5-7 days. Quinolones (norfloxacin, ciprofloxacin) and co-amoxiclav are the antibiotics that are usually prescribed. Urine culture should be repeated 2-3 days after the course of antibiotics.

Similarities Between Cystitis and Pyelonephritis

- Both cystitis and pyelonephritis are two different types of urinary tract infections.

- Commensals of the gastro intestinal tract are the commonest causative agents of both conditions.

What is the difference between Cystitis and Pyelonephritis?

Cystitis vs Pyelonephritis	
Pyelonephritis is the suppurative inflammation of the kidney and renal pelvis.	Cystitis is the inflammation of the bladder.
Type of Urinary Infection	
Pyelonephritis is an upper urinary tract infection.	Cystitis is a lower urinary tract infection.
Severity	
Pyelonephritis is a very severe condition.	Cystitis is not that severe unless it spreads to the kidneys.

Summary – Cystitis vs Pyelonephritis

Every clinician should have a proper understanding about the relevant clinical signs and symptoms of the two conditions discussed here in order to identify the difference between cystitis and pyelonephritis. If pyelonephritis is suspected, it is important to confirm the diagnosis through further investigations and start treatments as soon as possible.

References:

1. Kumar, Parveen J., and Michael L. Clark. Kumar & Clark clinical medicine. 9th ed. Edinburgh: W.B. Saunders, 2009. Print.
2. Kumar, Vinay, Stanley Leonard Robbins, Ramzi S. Cotran, Abul K. Abbas, and Nelson Fausto. Robbins and Cotran pathologic basis of disease. 9th ed. Philadelphia, Pa: Elsevier Saunders, 2010. Print

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2. “2605 The Bladder” By OpenStax College – Anatomy & Physiology, [Connexions Web site](#). Jun 19, 2013. (CC BY 3.0) via [Commons Wikimedia](#)

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APA: Difference Between Cystitis and Pyelonephritis. (2017, July 31). Retrieved (date), from <http://www.differencebetween.com/difference-between-cystitis-and-vs-pyelonephritis/>

MLA: "Difference Between Cystitis and Pyelonephritis." Difference Between.Com. 31 July 2017. Web.

Chicago: "Difference Between Cystitis and Pyelonephritis." Difference Between.Com. <http://www.differencebetween.com/difference-between-cystitis-and-vs-pyelonephritis/> (accessed [date]).



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