Diseases of the Urinary System….1095

Knowledge of the physiology of urinary secretion and excretion is required to properly understand disease processes in the urinary tract.

**Factions or urinary system**

* Remove waste products and medicines from the body.
* Balance the body's fluids.
* Balance a variety of electrolytes.
* Release hormones to control blood pressure.
* Release a hormone to control red blood cell production.
* Help with bone health by controlling calcium and phosphorus.

**Principles Of Renal Insufficiency**…..

1- The kidneys excrete the end products of tissue metabolism (except for carbon dioxide), and maintain fluid, electrolyte, and acid base balance, by varying the volume of water and the concentration of solutes in the urine.

2- The renal tissue composed of different nephrons which are the basic functional units of the kidney. Each nephron is composed of blood vessels, the glomerulus, and a tubular system that consists of the proximal tubule, the loop of Henle, the distal tubule, and the collecting duct.

3- The glomerulus allows passage of water and low molecular weight solutes, such as electrolytes, glucose, and keto acids, thus, Glomerular filtrate is derived from plasma by simple passive filtration driven by arterial blood pressure.

4- Epithelial cells in the renal tubules actively and selectively reabsorb substances
from the glomerular filtrate while permitting the excretion of waste products.

5- The principal mechanism that regulates water reabsorption by the renal tubules is antidiuretic hormone (ADH).

6- Diseases of the kidneys, and in some instances of the ureters, bladder, and urethra, reduce the efficiency of the kidney’s functions, resulting in disturbances in protein, acid base, electrolyte, and water homeostasis and in the excretion of metabolic end products which predispose to renal failure.

**Causes Of Renal Insufficiency, renal failure And Uremia……**

**Prerenal causes…. Which include**

1- Congestive heart failure and acute circulatory failure, in which acute renal
ischemia occurs in response to a decrease in renal blood flow, Therefore, Renal medullary necrosis is a direct finally result.

**Renal causes….. which include**

1-Glomerulonephritis, amyloidosis, pyelonephritis, embolic nephritis, and interstitial nephritis.

2- Acute renal failure can be produced by administration of a variety of toxins

3- The disease is also secondary to sepsis and hemorrhagic shock.

4- Experimental uremia has also induced by surgical removal of both kidneys

**Postrenal causes … which include**

1- Complete obstruction of the urinary tract by vesical or urethral calculus, or more rarely by bilateral urethral obstruction by transitional cell carcinoma located in the trigone region of the bladder.

2- Internal rupture of any part of the urinary tract, such as the bladder, ureters, or urethra.

**Pathogenesis Of Renal Insufficiency And Renal Failure….**

**1-** Any damage to the glomerular epithelium destroys the permeability and leads to the passage of plasma proteins into the glomerular filtrate. Therefore, all plasma proteins are lost.

2-Glomerular infiltration might end completely when ther are extensive damge of the glomerular tissue result in anuria

3- Decreased glomerular filtration also results in retention of metabolic waste products such as urea and creatinine which could result in increase serum urea nitrogen.

4- Loss of tubular resorptive function is evidenced by a continued loss of sodium and chloride,causing hyponatremia and hypochloremia

5- The terminal stage of renal insufficiency, renal failure, is the result of the cumulative effects of impaired renal excretory and homeostatic functions. results in dehydration.

6-Prolonged hypoproteinemia results in rapid loss of body condition and muscle weakness. Moreover, lethargy, in appetence and, with extensive glomerular lesions, edema will result .

7-Acute renal ischemia might result, leading to acute renal failure.

 **Variations In Daily Urine Flow(Macturaion)...**

**Polyuria…**

Itoccurs when there is an increase in the volume of urine produced over a 24­hour period.

**Causes ….**

1-Drinking excessive quantities of water (psychogenic polydipsia)

2-Central diabetes insipidus, when there is abnormality of ADH (nephrogenic diabetes insipidus).

3- Tumors of the pars intermedia of the pituitary gland.

4- Administration of diuretic drugs

5-Renal diseases

**Oliguri. and Anuria…..**

Its reduction in the daily output of urine (**oliguria**) and complete absence of urine (**anuria**) occur under the same conditions and vary only in degree.

Causes…..

1-Dehydration

2- Congestive heart failure and peripheral circulatory failure may cause a reduction in renal blood flow that oliguria follows.

3- Complete anuria is most common in urethral obstruction, although it can also result from acute tubular nephrosis.

**Dribbling urination…..**

Is a stable intermittent passage of small volumes of urine, sometimes precipitated by a change in posture or increase in intra-abdominal pressure, reflecting inadequate or lack of sphincter control. Dribbling occurs in large animals with incomplete obstructive urolithiasis .

**Dysuria…**

It’s a difficult and slow urination accompanied by Abdominal pain and painful urination.

It mostly occurs in cystitis, vesical calculus, urethritis,and is caused by the presence of periurethral masses such as pelvic lymphoma.

 Dysuria is manifested by the frequent passage of small amounts of urine. Grunting may occur with painful urination, and the animal may remain in the typical posture after urination is completed.

**Stranguria….**

Its a slow and painful urination associated with disease of the lower urinary
tract including cystitis, urethral obstruction, and urethritis. The animal strains to pass each drop of urine.

**UREMIA….**

It is a clinical condition associated with bad renal functions, characterized by fluid, electrolyte, hormonal, and metabolic abnormalities.

Uremia is the systemic state that occurs always in the terminal stages of renal insufficiency accompanied mostly with Anuria or oliguria.

The uremic animal is depressed and anorexic with muscular weakness and tremor, **However, In chronic uremia**, the body condition become poor, as a result of continued loss of protein in the urine, dehydration, and anorexia. The respiration is usually increased in rate and depth, Moreover, An ammoniacal or uriniferous smell on the breath is often described.

**Uremic encephalopathy…**

Itoccurs sometimes of cattle, goats, and horses with chronic renal failure that involves an unknown metabolic pathway. It is associated with seizures, tremors, abnormal behavior, and muscle weakness, The animal becomes recumbent and comatose in the terminal stages of uremia, Moreover, The temperature falls to below normal and death occurs quietly.

On clinical pathological examinations diseased animals show, serum urea concentration, serum creatinine concentration as well as serum uric acid.

**Principles of Treatment of Urinary Tract Disease…**

1- Remove the primary cause

2-Correction of dehydration by using Fluid and Electrolytes

3-Hemodialysis( renal replacement therapy غسيل الكلى

4-Antimicrobial Agents…

The ideal antimicrobial for treatment of urinary tract infections should have several criteria.

Such as

1-Be active against the causal bacteria

2- Be excreted and concentrated in the kidney and urine

3- Be active at the pH of urine

4-Have low toxicity, particularlynephrotoxicity

5- Be easily administered

6-Below in cost

7-Have no harmful interactions with other concurrently administered drugs

Ant microbes such as penicillin, ampicillin, amoxicillin, ceftiofur, and cefquinome in ruminants and trimethoprim­sulfonamides and ceftiofur in horses.

**Glomerulonephritis…..**

* It can occur as a primary disease or as a component of diseases affecting several body systems.
* In primary glomerulonephritis, the disease involves only the kidney, However, the inflammatory process could extends to affect the surrounding interstitial tissue and blood vessels.
* The disease is sometimes associated with other chronic, systemic illness
* Glomerulonephritis is a common cause of chronic renal failure
* The **nephrotic syndrome** is seen in some advanced cases of glomerulonephritis and is a clinical syndrome characterized by proteinuria, hypoproteinemia leading to generalized edema, and hypercholesterolemi

**Dermatitis–nephropathy syndrome**

* Is a systemic necrotizing vasculitis and glomerulonephritis syndrome of growing animals in the UK and Canada. The causes unknown, but an immune­mediated pathogenesis is suspected.

**Pyelonephritis….**

It’s usually develops by ascending infection from the lower urinary tract. Clinically is characterized by pyuria, hematuria, cystitis, ureteritis, and suppurative nephritis.

**Etiology**…..
1- Secondary to bacterial infections of the lower urinary tract
2-Spread from embolic nephritis of hematologic origin such as septicemia in cattle associated with *Pseudomonas aeruginosa*3-Specific pyelonephritis associatedwith *C. renale, C. pilosum* (formerly *C. renale* type 2), and *C. cystitidis* (formerly *C. renale* type 3) in cattle and

3-Secondary to anatomic abnormalities of the kidneys or distal structures permitted ascending infection of the kidney
4-In association with nephroliths, although whether the nephrolith or the pyelonephritis occurred first is uncertain.

**Pathogenesis…..**1-Pyelonephritis develops when bacteria from the lower urinary tract ascend the ureters and become established in the renal pelvis and medulla.

2- Bacteria are help in ascending the ureters by urine stasis which result from blocking of the ureters by inflammatory swelling or debris by pressure from the uterus in pregnant females, and by obstructive urolithiasis.

3- Pyelonephritis causes systemic signs of toxemia and fever and, if renal involvement is bilateral and sufficiently extensive, uremia will develops.

**Clinical Findings….**

1- Most affected animals die without premonitory illness.

2-Diseased animals show signs of lose weight, emaciated, fever, pyuria or hematuria, and intermittent episodes of abdominal pain.

3- Ultrasonographic examination of the kidneys indicate abnormally shaped kidneys with loss of the cortico-medullary gradient, hypoechoic or hyperechoic abnormalities in the renal cortex, and increased echogenicity.

**Clinical Pathology…**

Erythrocytes, leukocytes, and cell debris are present in the urine on microscopic examination .

**Treatment …**

Follow the same as in Principles of Treatment.

**Nephrosis**

\*It inncludes degenerative and inflammatory lesions of the renal tubules, particularly the proximal convoluted tubules.

\*Nephrosis is the most common cause of acute kidney failure and uremia

Nephrosis is classified into two main groups:

 **(1) tubular injury caused by ischemic insult and**

**(2) cell death or damage to the tubules caused by nephrotoxins**

**Ischemic Nephrosis**

Reduced blood flow through the kidneys usually is caused by general circulatory failure. There is transitory oliguria followed by anuria and uremia if the circulatory failure is not corrected.

**Etiology…**

**Acute Renal Ischemia….**

1-General circulatory emergencies such as shock, dehydration, acute hemorrhagic
anemia, and acute heart failure; renal failure secondary to calf diarrhea has
been described

2-Embolism of renal artery, recorded in horses

3-Extreme ruminal distension in cattle

**Chronic Renal Ischemia**…

Chronic circulatory insufficiency such as congestive heart failure

**Pathogenesis…..**Acute ischemia of the kidneys occurs when compensatory vasoconstriction affects the renal blood vessels in response to a sudden reduction in cardiac output

glomerular filtration will decreases, and metabolites accumulate in the bloodstream, Therefore, The concentration of urea nitrogen in plasma or serum increases, result in uremia.

**Clinical Findings….**

1-Oliguria and azotemia will occur

2- Renal insufficiency may cause a poor response to treatment followed by hemorrhagic or hemolytic anemia, dehydration and shock.

**Treatment…**Treatment must be directed at correcting fluid, electrolyte, and acid­base disturbance as soon as possible.

**Cystitis**
Inflammation of the urinary bladder is usually associated with bacterial infection and is characterized clinically by frequent, painful urination and the presence of blood (hematuria), inflammatory cells, and bacteria in the urine.

**Etiology….**1-Cystic calculus

2- Difficult parturition

3-Contaminated catheterization

4- Late pregnancy

5-As a sequel to paralysis of the bladder; a

**Clinical Findings …..**

1-The urethritis that usually accompanies cystitis causes painful sensations and the desire to urinate. Urination occurs frequently and is accompanied by pain and sometimes grunting

2- The animal remains in the urination posture for longer time without dripping or passing of small amount of urine

**3-** Sings of abdominal pain, as evidenced by hit with the hind feet, kicking at the belly and swishing with the tail, and a moderate febrile reaction

4-Acute retention of urine sometimes occur .

**Treatment ….**

Same as in principles

**Enzootic Posthitis (Pizzle Rot, Sheath Rot, Balanoposthitis) And
Vulvovaginitis (Scabby Ulcer)**

**Etiology…**

1-High protein and urea diet which result in cytotoxic levels of ammonia

2- Estrogens in pasture, causing swelling and congestion of the prepuce, may predispose to disease

3- *C. renale*, with urase producing bacteria as well as *Mycoplasma mycoides* are all play good role in causing the disease

**Clinical Findings …..**

1-The primary lesion starts as a pustule, which breaks and forms a soft scab. Small scabs are found on the skin dorsal to the preputial orifice (**external lesion**) and around the external orifice on the non haired part of the prepuce.

2-Lesion could enter inside the prepuce causing (internal lesion)which cause ulceration of the prepuce and hardening as well as pus production .

3- Affected animal may show restlessness, kicking at the belly, and dribbling urine
However, The area is often infested by blowfly maggots.

4-The development of pus and fibrous tissue adhesions may interfere with urination and protrusion of the penis and cause permanent impairment of function.

5- Some deaths occur from obstructiveuremia, toxemia, and septicemia.

6- In females ( Mostly ewes) the lesions are confined to the lip of the vulva and consist of pustules, ulcers, and scabs. These extend minimally into the vagina.

**Treatment**….
1-The principal measures are restriction of the diet to reduce the urea content of the urine,

2-removal of the wool around the prepuce or vulva to reduce the risk of fly strike, and disinfection of the preputial area

3- Weekly application of a 10% copper sulfate ointment is recommended for external lesions

4-When the interior of the prepuce is involved, it should be irrigated twice
weekly with a 5% solution of copper sulfate

5-penicilline 5000-10000IUlanimal Im for 3-5 days or oxytetracycline 10-20mg/ kg BW for 3-5 days I.M

6-Surgical treatment of severe cases