

Clinical feature of urinary tract disease

The major clinical manifestations of urinary tract disease are :

- Abnormal constituents of urine
- Variation in daily urine flow
- Abdominal pain and painful and difficult urination dysurea and strangurea
- Abnormal size of kidneys
- Abnormalities of the bladder and urethra
- Acute and chronic renal failure

Abnormal constituent of urine :

Protein urea

Normal urine contains only small amounts of proteins that is insufficient to be detected using standard test. Protein urea is observed in normal foals, calves and lambs in the first 40 hours after receive colostrum.

Protein may be present in haemoglobin urea, myoglobin urea and haematuria and when urinary tract infection are present. These causes of protein in urine should be excluded before, making a diagnosis of renal disease.

Protein urea is often designated as albumin urea because of the high proportion of albumin present, it is occur in glomerulonephritis, renal infarction, tubular nephrosis and amyloidosis.

Small amount of protein may be present in the urine of animals suffering from fever and toxemia. The amount of protein in the urine and severity of protein urea varies with the disease condition and with severity and stage of the disease.

Protein urea can be quantified by determination amount of protein passed in 24 hours period by indexing urinary protein to urinary creatinine in single urine sample.

Chronic protein urea and massive acute protein urea may cause hypoproteinemia as occur in chronic glomerulonephritis and acute nephrosis in horses and amyloidosis in cattle.

When protein urea originates from pyelonephritis cystitis other clinical and clinico - pathological evidence of these disease usually present.

Casts and cells

Casts are organized tubular structures which vary in appearance depending on their composition. They occur only when the kidney involved in disease process. They are present as an indication of inflammatory or degenerative changes in the kidney where they form by agglomeration of desquamated cells and Tamm- horsfall protein. Casts may not form in all cases of renal disease. In addition , casts readily dissolve in alkaline urine and are best detected in fresh urine sample.

Erythrocytes, leukocytes and epithelial cells in urine may be originate in any part of the urinary tract.

Haematuria

Haematuria can result from prerenal causes when vascular damage occurs, such as trauma to the kidney, septicemia and purpurea haemorrhagica , renal causes include acute glomerulonephritis, renal infraction , embolism of the renal artery, tubular damage as caused by toxic insult and pyelonephritis. Post renal haematuria in cattle when haemorrhage originates from tumors of the urinary bladder. In horses there is a syndrome

of ulceration of the proximal urethra that cause haematuria at the end of urination.

In severe cases of haematuria blood may be voided as grossly visible clots but more commonly it causes a deep red to brown coloration of the urine.

Less severe on standing may show only cloudiness which settles to form red deposit on standing. The haematuria may be so slight that is detectable only by microscopic examination of a centrifuged sediment . In females free flow urine samples may be contaminated by blood from the reproductive tract. It may be necessary to collect a samples by catheterization to avoid the chance of contamination of urine in the vagina.

Because RBCs can be lysed in dilute urine, red – colored urine should be examined microscopically for the presence of erythrocytes. The presence of a heavy brown deposit is not sufficient basis for a diagnosis of haematuria as this may also occur in haemoglobinuria. If the bladder or urethra are involved in the process that cause haematuria, abnormalities may be detectable on physical examination. Gross haematuria persisting for long periods may results in severe blood loss anaemia.

Haemoglobinuria

False haemoglobinuria can occur in haematuria when erythrocytes are lysed and release their haemoglobin. In this cases sediment for cellular debris.

The haemoglobinuria cause a deep red to brown coloration of urine and gives a positive reaction to biochemical test for Hb there is no erythrocyte debris in sediment, Dipstick tests for protein urea may be

positive unless the concentration of haemoglobin is high. There are many causes of intravascular haemolysis, the source of Hb urea.

Normally Hb liberated from circulating erythrocytes is converted to bile pigments in the cells of reticuloendothelial system, if haemolysis exceeds the capacity of this system to remove the haemoglobin, it accumulates in the blood until it exceeds a certain renal threshold and then passes into urine. Some haemoglobin is re absorbed from the glomerular filter by the tubular epithelium but probably not in sufficient amount to appreciably affect the haemoglobin content of the urine. Hb urea will only be present when the plasma concentration exceeds the renal threshold.

Myoglobinuria

The presence of myoglobin in the urine is evidence of severe muscle damage. The only notable occurrence in animals is azoturia of horses. Myoglobinuria does not occur commonly in enzootic muscular dystrophy because there is insufficient myoglobin in the muscles of young animals. The myoglobin molecule is much smaller than Hb molecules and passes the glomerulus much more readily, so a detectable dark brown staining of the urine occurs without very high plasma levels of myoglobin.

Pyuria

Leukocytes or pus in urine indicates inflammatory exudation at some points in the urinary tract, usually in the renal pelvis or bladder. Pyuria may occur as grossly visible clots or shreds, but often is detectable only by microscope. Individual cells and leukocytic casts may be present. Pyuria is usually accompanied by presence of bacteria in urine.

Crystaluria

Crystals in urine herbivorous animals have no special significant unless they occur in very large numbers and are associated with clinical signs of irritation of urinary tract. Calcium carbonate and triple phosphate crystals are commonly present in normal urine. If they occur in large numbers, it may suggest that urine is concentrated and indicate the possible future development of urolithiasis.

Glucosuria and ketonuria

Glucosuria in combination with ketonuria occurs only in diabetes mellitus, a rare disease in large animals. Ketonuria is more common finding in ruminant it occurs in starvation, acetoneuria of cattle and pregnancy toxemia in ewes. A small amount of ketonuria is normally present in lactating dairy cows. As result it is important that the assay method used to demonstrate ketonuria is appropriate for urine since there may be risk for false positive reaction on some tests.

Variations in daily urine flow

Normal urine production is highly variable in large animals, in healthy adult horses normal urine production ranged from 0.62 to 2.01 ml/kg per hour. Neonatal foals produce urine at average rate of 150ml / kg per day. Care should be taken to differentiate between increased daily flow and increased frequency without increased flow.

Polyuria

Polyuria occurs when there is increase in the volume of urine produced , polyuria can result from external causes as when horses drink excessive quantities of water and less commonly in central diabetes isipidus when there is inappropriate secretion of anti diuretic hormone (ADH) from the pituitary gland. Anther external causes is administration of diuretics drugs including corticosteroids.

Kidney disease result in polyuria is also occur when the osmotic gradient in the renal medulla is not adequate to produce concentrated urine. Polyuria also occur in diabetes isipidus when the tubules fail to respond to ADH.

When polyuria is suspected a urine sample should be collected to determine specific gravity or osmolarity. If urine is isotonic with constant specific gravity of 1.008-1.012 then the presence of renal disease should be considered . Blood urea and creatinine are within normal limits a water deprivation test may be preformed on horses to asses their ability to produce concentrated urine.

Pollakiuria

This is abnormally frequent passage of urine. It may occur with or without increase in the volume of urine excreted and is commonly associated with disease of the lower urinary tract such as cystitis, bladder calculi , urithritis and partial obstruction of urethra.

Oliguria and anuria

Reduction in the daily out put (Oliguria) and complete absence of urine (anuria) occur under the same conditions and vary only in degree.

In dehydrated animals urine flow naturally decrease in an effort to conserve water as plasma osmotic pressure increase . Congestive heart failure and peripheral circulatory failure may cause a reduction in renal blood flow which cause oliguria

Complete anuria occurs most commonly in urethral obstruction and it may result from tubular nephrosis. Oliguria occurs in the terminal stage of all forms of nephritis . Anuria and polyuria lead to retention of urea and disturbances of acid –base balance .

Dribbling

Is a steady intermittent passage of small volume of urine, sometimes precipitated by a change in posture reflecting inadequate or lack of sphincter control. Dribbling occurs in large animals with incomplete obstructive urolithiasis and from persistent urachus.

Persistent urachus

(Also called pervious or patent urachus) failure of the urachus obliterate at birth causes urine to dribble from the urachus continuously. The urine may also pass from the urethra retrograde infection from omphalitis is common resulting cystitis.

Abdominal pain, painful and difficult urination

Abdominal pain and painful urination (dysuria) and difficult and slow urination (strangurea) are manifestations of discomfort caused by disease of urinary tract.

Acute abdominal pain from urinary tract disease occurs only rarely and usually associated with sudden distension of the renal pelvis or ureters,

or infraction of the kidney. Non of these condition is common in animals but occasionally cattle affected with pyelonephritis may have episodes of acute abdominal pain due to either renal infraction or obstruction of the pelvis by necrotic debris. During these acute attacks of pain the cow may exhibit downward arching of the back, paddling with the hind feet, rolling and bellowing.

Abdominal pain from urethral obstruction and distension of the bladder is manifested by tail switching, kicking at belly and repeated straining effort at urination accompanied by grunting. Horses with acute tubular nephrosis following Vit K₃ administration may show colic with arching of the back , backing into corners and rubbing of the perineum and tail head.

Dysuria or painful difficult urination

Occurs in cystitis , vesicle calculus and urithritis and manifested in frequent passage of small amount or urine. Grunting may be occur with painful urination and the animal may be remain in the typical posture after urination is complete. Differentiating pain due to other causes depends largely on the presence of other sings indicating urinary tract involvement.

Strangurea:- is so slow and painful urination associated with disease of the bower urinary tract including cystitis, vesicle calculus, urethral obstruction and urithritis. The animals strains to pass each drop of urine. Groaning and straining may precede and a company urination when there is urethral obstruction in urithritis groaning and straining occurs immediately after urination has ceased and gradually disappear and do not recur do not until urination had been repeated.

Morphological abnormalities of the kidneys and ureters

Enlargement or decrease size of kidney may be palpable on rectal examination or detected by ultrasonography, abnormalities in the kidneys such as hydronephrosis in cattle may also be palpable on rectal examination. Increase In the size of ureters may be palpable on rectal examination and indicate urithritis.

Palpable abnormalities of the bladder and urethra

Abnormalities of the bladder which may be palpable by rectal examination include:- gross enlargement of the bladder, rapture of the bladder, a shrunken bladder following rupture, and palpable abnormalities of the bladder such as cystic calculi.

Abnormalities of urethra include: enlargement and pain of the pelvic urethra and its external aspect in male cattle with obstructive urolithiasis, and obstruction of the urethral process of male sheep with obstructive urolithiasis.

Acute and chronic renal failure

The clinical findings of urinary tract disease vary with the rate of development and stage of the disease. In most cases , the clinical sings are those of the initiating causes. In horses mental depression, colic and diarrhea are common with oliguria or polyuria. Cattle with uremia are similar and in addition are frequently recumbent and my have a bleeding diathesis. In chronic renal disease of all species there is a severe loss of body weight, anorexia , polyuria, polydipsia and ventral edema.

Uremia

Uremia is the systemic state which occurs in the terminal stage of renal insufficiency. Anuria or oliguria may occur with uremia. Oliguria is more common unless there is complete obstruction of the urinary tract. Chronic renal disease is usually manifested by polyuria but Oliguria appears in the terminal stages when clinical uremia develops.

The uremic animal is depressed and anorexic with muscular weakness and tremor. In chronic uremia the body condition is poor due probably to loss of protein in the urine, dehydration and anorexia. The respiration is usually increased in rate and depth but is not dyspneic ; in the terminal stages it may become periodic in character . The heart rate is markedly increased because of terminal dehydration and myocardial asthenia but the temperature remains normal except in infectious process and some cases of acute tubular nephrosis. An ammoniac and uriferous smell on the breath is often described but is usually undetectable.

The animal becomes recumbent and comatose in the terminal stages. The temperature falls to below normal and death occurs quietly. The whole course of the disease having been one of gradual intoxication. There are rare reports of encephalopathy caused by renal insufficiency.

Uremia has been produced experimentally in cattle by bilateral nephrectomy and urethral ligation. There is a progressive metabolic alkalosis, hypercapnia and elevation of blood urea (up to 90 mmol/L) and creatinine.

Principle of treatment of urinary tract disease

❖ fluids & electrolytes

Treatment of acute renal failure in all species is aimed at removing the primary cause and restoring normal fluid balance by correcting dehydration, acid- base balance and electrolyte abnormalities the prognosis of acute renal failure will depend on the primary cause and severity of the lesion of acute disease process can be stopped , the animal may be able to survive on its remaining functional renal tissue. When toxic nephrosis is suspected , an attempt should be made to identify and remove the primary cause or to the animals from the suspected environment.

Balanced electrolyte solution or normal saline supplemented with potassium and calcium can be used to correct fluids and electrolytes deficits. The required volume of replacement fluid can be determined on the basis of clinical sings. As the fluid deficit is corrected, the patients should observed for urination. If anuria or oliguria is present the rate of fluid administration should be monitored to prevent over hydration. If the animal has oliguria after the fluid volume deficit is corrected , a diuretics may be used to help restore urine flow. Furosemide (1-2 mg/kg BV every 2 hours) or mannitol (0.25 -2.0 g/kg bw in 20% solution) may be used.

Diuretics should be not used until dehydration has been corrected after urine flow is restored the resulting diuresis will increase the maintenance fluid requirement. Animals that remain anuric have a grave prognosis and can only be managed with peritoneal or vascular dialysis.

The treatment of chronic renal failure will depend on the stage of disease and the value of the animal. In chronic failure , therapy is aimed at prolonging life. If food producing animals, emergency slaughter is not recommended because the carcass is usually unsuitable for human

consumption. Animals in chronic failure should have access to water and salt unless edema is present. Stress such as sudden environment and dietary changes should be avoided.

Antimicrobials

Selection of antimicrobials for the treatment of urinary tract infections should be based on quantities urine culture.

The ideal antimicrobial for treatment of urinary tract infections should meet several criteria. It should have :-

- 1- Activity against the caused bacteria.
- 2- Be excreted and concentrated in the kidney and urine.
- 3- Be active at the pH of urine.
- 4- Low toxicity.
- 5- Be easily administered.
- 6- Low in cost.
- 7- No harmful interactions with other concurrently administered drugs.

Appropriate first line antimicrobials include : penicillin in ruminant and trimethoprim sulfa in horses . Antimicrobial therapy for lower urinary tract infections should be continue at least 7 days ; for upper urinary tract infections 2-4 weeks of treatment is often necessary. Success of therapy can be evaluated by repeating urine culture 7-10 days after last treatment.