

NEPHROTIC SYNDROME

BASICS

OVERVIEW

- “Nephrotic” is an adjective that refers to anything that relates to disease of the kidney
- The kidney filters the blood and removes various waste products from the body as it produces urine; the kidney also is involved in maintaining the normal fluid volume of the body; each kidney is composed of thousands of nephrons (the functional units of the kidney, each consisting of the glomerulus [a tuft of blood capillaries—the “blood filter”] and a series of tubes and ducts, through which the filtered fluid flows, as urine is produced)
- Nephrotic syndrome is a medical condition in which the animal has significant levels of protein in its urine (known as “proteinuria”); low levels of albumin [a type of protein] in its blood (known as “hypoalbuminemia”); high levels of cholesterol in its blood (known as “hypercholesterolemia”); and fluid accumulation in the abdomen (known as “ascites”), in the space between the chest wall and the lungs (known as “pleural effusion”), and/or under the skin (known as “subcutaneous edema”)
- Nephrotic syndrome occurs secondary to glomerular disease (such as glomerulonephritis, kidney or renal amyloidosis)
- Glomerulonephritis is inflammation and accompanying dysfunction of glomeruli (plural of glomerulus); most commonly due to the presence of immune complexes in the glomerulus
- Renal amyloidosis is a condition in which insoluble proteins (amyloid) are deposited outside the cells of the kidneys, compromising the normal function of kidney

GENETICS

- No breed appears to be at increased risk of developing the nephrotic syndrome complication with glomerular disease
- Familial glomerular diseases (glomerular disease that runs in certain families of animals) have been reported in several breeds, including Bernese mountain dogs, bull terriers, Dalmatians, Samoyeds, Doberman pinschers, cocker spaniels, Newfoundlands, rottweilers, greyhounds, soft-coated wheaten terriers, and cats
- Familial amyloidosis (condition that runs in certain families of animals, in which insoluble proteins [amyloid] are deposited outside the cells in the kidney, compromising its normal function) is common in Chinese shar peis; sporadic cases of affected litters have been reported in other breeds

SIGNALMENT/DESCRIPTION of ANIMAL

Species

- Dogs and cats

Breed Predislection

- No breed appears to be at increased risk of developing the nephrotic syndrome complication with glomerular disease

Mean Age and Range

- Mean age of dogs with glomerulonephritis—6.5 to 7.0 years; range, 0.8 to 17 years
- Cats with glomerulonephritis—mean age at presentation is 4.0 years
- Most dogs and cats with kidney or renal amyloidosis (in which insoluble proteins [amyloid] are deposited outside the cells in the kidney, compromising its normal function) are over 5 years of age

SIGNS/OBSERVED CHANGES in the ANIMAL

- Fluid build-up under the skin that retains an indentation produced by finger pressure on the tissue (known as “pitting subcutaneous edema”) and/or fluid build-up in the abdomen (ascites) are the most common reason the owner seeks veterinary care
- Occasionally, signs associated with an underlying infectious or inflammatory disease or cancer may be the primary reason why owners seek veterinary care
- Rarely, dogs may exhibit sudden (acute) difficulty breathing (known as “dyspnea”) or severe panting due to fluid build-up in the space between the chest wall and lungs (pleural effusion), fluid build-up in the lungs (known as “pulmonary edema”), or blood clots in the lungs (known as “pulmonary thromboembolism”)
- Complications of high blood pressure (hypertension): bleeding in the back of the eye (known as “retinal hemorrhage”) or loss of attachment of the retina to the underlying structures of the eye (known as “retinal detachment”); fluid build-up/swelling of the optic disk (known as “papilledema”); irregular heart beats (known as “arrhythmias”) and/or heart murmurs, secondary to enlargement of the left ventricle (known as “left ventricular hypertrophy”)
- Difficulty breathing (dyspnea) and bluish discoloration of the skin and moist tissues (mucous membranes) of the body caused by inadequate oxygen levels in the red-blood cells (known as “cyanosis”) in dogs with fluid build-up in the space between the chest wall and lungs (pleural effusion) or blood clots in the lungs (pulmonary thromboembolism)

CAUSES

- Nephrotic syndrome occurs secondary to glomerular disease (such as glomerulonephritis, kidney or renal amyloidosis)
- Glomerulonephritis or amyloidosis may occur secondary to chronic inflammation (such as caused by infection, cancer, and immune-mediated disease)

TREATMENT

HEALTH CARE

- Most patients can be treated as outpatients; exceptions include patients that have very high levels of urea and other nitrogenous waste products in the blood (condition known as “uremia” or “azotemia”) and/or high blood pressure (hypertension); patients with blood-clotting disease (known as “thromboembolic disease”)
- Tapping the abdomen to drain off excessive fluid (known as “abdominocentesis”) and/or tapping the chest to drain off excessive fluid (known as “thoracocentesis”) is used in patients with severe breathing difficulties (known as “respiratory distress”) and abdominal discomfort caused by fluid build-up in the abdomen (ascites) and/or fluid build-up in the space between the chest wall and the lungs (pleural effusion); in most patients, removal of fluid will only increase the rate of fluid accumulation and contributes to electrolyte abnormalities via removal of large amounts of sodium from the body
- Plasma transfusion is not indicated for treatment of low levels of albumin (a protein) in the blood (hypoalbuminemia); large amounts of plasma are required to significantly increase serum albumin concentrations, and transfused protein does not remain in the circulation for long
- Intravenous human albumin is only indicated in the very rare cases where patients develop life-threatening complications (such as fluid build-up in the lungs [pulmonary edema]; fluid build-up in the space between the chest wall and lungs [pleural effusion])

ACTIVITY

- Restriction of activity may be beneficial because of the possibility of blood-clotting disease (thromboembolic disease)

DIET

- Sodium-reduced, high-quality, low-quantity protein diets—commercial “kidney diets” meet these criteria
- Dietary protein supplementation formerly was recommended to offset the effects of loss of protein into the urine (proteinuria); however, normal or high dietary protein may contribute to the progression of kidney disease, thus dietary therapy should include a reduced (not restricted) amount of high-quality protein (such as found in Hill’s Prescription Diet® (canine or feline) k/d®)

SURGERY

- Biopsy is required to differentiate between glomerulonephritis and amyloidosis

MEDICATIONS

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive.

Fluid Build-Up (Edema and Ascites)

- Dietary sodium reduction
- Reserve tapping the abdomen to remove excessive fluid (abdominocentesis) and drugs to increase the amount of urine (fluid) eliminated from the body (known as “diuretics”) for patients with severe breathing difficulties (respiratory distress) and abdominal discomfort
- Overzealous use of diuretics may cause dehydration and sudden (acute) kidney decompensation

Protein in the Urine (Proteinuria)

- Angiotensin-converting enzyme (ACE) inhibitors decrease loss of protein into the urine (proteinuria); in one prospective study, enalapril (an ACE inhibitor) decreased high blood pressure and protein loss into the urine and decreased progression of kidney disease in dogs with glomerulonephritis of unknown cause (condition known as “idiopathic glomerulonephritis”)—proteinuria is directly toxic to kidney tubules; therefore, ACE-inhibitor therapy should be initiated at the time of diagnosis, unless the patients has very high levels of urea and other nitrogenous waste products in the blood (uremia or azotemia)

FOLLOW-UP CARE

PATIENT MONITORING

- Urinary protein:creatinine ratio; serum urea nitrogen, creatinine, albumin, and electrolyte concentrations; blood pressure; and body weight; ideally, recheck examinations should occur 1, 3, 6, 9, and 12 months after initiation of treatment

POSSIBLE COMPLICATIONS

- Long-term (chronic) kidney insufficiency or failure
- Blood clots to the lungs (pulmonary thromboembolism)

EXPECTED COURSE AND PROGNOSIS

- If the underlying cause cannot be identified and corrected, glomerulonephritis and amyloidosis usually are progressive, eventually resulting in chronic kidney failure

- Once azotemia (high levels of urea and other nitrogenous waste products in the blood) and kidney failure develop, prognosis is often poor due to rapidly progressive disease

KEY POINTS

- Nephrotic syndrome is a medical condition in which the animal has significant levels of protein in its urine (known as “proteinuria”); low levels of albumin [a type of protein] in its blood (known as “hypoalbuminemia”); high levels of cholesterol in its blood (known as “hypercholesterolemia”); and fluid accumulation in the abdomen (known as “ascites”), in the space between the chest wall and the lungs (known as “pleural effusion”), and/or under the skin (known as “subcutaneous edema”)
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