Introduction:

Disorders of the urinary tract are common conditions in rabbits, rodents and ferrets. This lecture aims to present some urinary tract diseases often seen in practice and discusses common symptoms, diagnostic possibilities and treatment options including surgery.

Disorders of the Urinary System

Cystitis

Spontaneous bacterial cystitis is rare in ferrets. Therefore, if cystitis is identified in ferrets, a thorough examination for underlying diseases such as adrenal-associated prostatomegaly or urolithiasis is important (1). In rabbits cystitis is common and may be one of the predisposing factors for urolithiasis development (2). Bacteria such as *S. aureus*, *Proteus* species and *E. coli* are commonly associated with cystitis (1).

Infection may initially be asymptomatic, or the patients show pollakisuria, dysuria, hematuria, and unspecific symptoms such as lethargy, anorexia or depression. To identify the causative agent a urinalysis and bacterial culture is necessary. Some rodents and rabbits readily urinate during handling. However, urine culture and sensitive testing always requires samples collected under sterile conditions via cystocentesis. For this, sedation maybe necessary in easily stressed animals (1). Blood testing and sonographic examinations can help to determine the patients’ prognosis and to identify any accompanying illnesses.

Treatment of cystitis contains of analgesia, supportive care, fluid therapy and antibiotics according to culture results (1).

Renal Disease and Renal Failure

Renal pathology is a common necropsy finding in ferrets. In older rabbits as well as aging rats acute and chronic renal failure can occur (1). Clinical signs include lethargy, depression, anorexia, gastrointestinal disease, ataxia, polyuria and polydipsia. In chronic renal failure there is often an additional history of loss of body condition (1). Blood testing (e.g. Serum creatinine, blood urea nitrogen levels, haematocrit and electrolyts) and urine analysis are important diagnostic tools. Common findings can include isosthenuria, hematuria, proteinuria or pyuria. A bacterial culture is important to screen for infectious causes (1). Ultrasound examination or radiography can be used to identify any underlying cause of disease (e.g. urolithiasis) (1).

In rabbits pyelonephritis is often caused by *P. multocida* or *Staphylococcus* species. *Enzephalitozoon cuniculi* is a common cause of subclinical, chronic, interstitial nephritis (1). Interstitial nephritis, pyelonephritis, glomerulonephritis, bilirubinuric nephrosis and immune complex-mediated glomerulonephropathy caused by Aleutian disease can cause renal failure in ferrets (1).
Treatment focuses on diuresis and diminishing the consequences of uremia. Therapy should always be aimed at the underlying cause of disease. In chronic renal failure supportive therapy is often the only option and. Acute renal failure has a higher potential for response to treatment (1).

In rats chronic progressive nephrosis (CPN) is the best known age-related disease. The enlarged kidneys in these cases often contain pinpoint cysts. Histological lesions consist of a progressive glomerulosclerosis and myriad tubulointerstitial disease primarily involving the convoluted proximal tubule (3). The disease is of greater severity in males than in females. Obtaining a blood sample and urine analysis is very important for to make a diagnosis. Elevation of blood urea nitrogen and proteinuria (exceeding 10 mg/day) are typical findings (1). Dietary factors play an important role in the progression of CPN: Caloric restriction and the feeding of low-protein diets can reduce the incidence and severity of CPN. However, treatment of CPN is only supportive and includes diet improvement and the administration of anabolic steroids (1).

Tumors of the urinary tract

In rabbits benign embryonal nephromas are common incidental findings at necropsy. Lymphosarcoma of the kidneys, renal carcinoma and leomyoma have also been reported in this species. Moreover a triphasic nephroblastoma was diagnosed in a 1-year-old Angora rabbit (1, 4).

Prostatic tumors such as prostatic seminoma and carcinoma with a poor prognosis have been reported in ferrets (1). Renal tumors are very rare in ferrets. The most commonly reported primary tumor is the renal pelvic transitional cell carcinoma (1, 5). Other reported tumors in ferrets include renal adenocarcinoma, renal adenoma and papillary tubular cystadenoma and transitional cell carcinoma of the urinary bladder (1).

However, Primary renal tumors may be successfully treated with nephrectomy and surgical excision (1).

Urolithiasis

Urolithiasis is a common condition in rabbits and guinea pigs. Their particular calcium-metabolism and other predisposing factors like obesity and little exercise can lead to the formation of predominantly calcium carbonate stones in the urinary tract of those animals. Intestinal absorption of calcium in these animals is independent of vitamin D₃ levels an increases with a high dietary supplementation of calcium. The fractional urinary excretion of calcium in rabbits and guinea pigs is 45 % to 60 %, compared to less than 2 % in most mammals(1).

Especially male chinchillas can also develop urinary calculi and urolithiasis consisting of calcium carbonate (1, 6). Compared with guinea pigs, rabbits and chinchillas, urolithiasis is relatively infrequent in rats and ferrets. Most uroliths found in rats were composed of struvite (7). The most common urinary calculus reported in ferret is of magnesium ammonium phosphate or struvite origin. Dietary factors are believed to play an important role in struvite crystal formation (1).

Affected animals are often presented with hematuria, stranguria or anuria and nonspecific symptoms like anorexia, hypothermia and lethargy. Clinical examination and advanced diagnostic testing (radiography, ultrasound and blood testing) are very important to make a final diagnosis and to decide which therapy is indicated. Calcium carbonate uroliths are always radiopaque and radiography is therefore the diagnostic method of choice in rabbits and guinea pigs.

Further diagnostics like ultrasound and blood testing can aid to determine the patients prognosis. Postrenal azotaemia is a common problem in context with urolithiasis due to the fractional or total obstruction of the urinary tract. Furthermore, dilatations of the renal pelvis and/or the ureter can be easily identified during a sonographic examination.
Typical results of urinalysis in patients with urolithiasis can be hematuria and crystalluria. Sometimes it is difficult to differentiate between normal calcium carbonate deposits and abnormal amounts of sludge in rabbits (8). In entire female rabbits pathologies of the reproductive tract can also cause hematuria. Therefore, uterine adenocarcinomas and endometrial venous aneurysms have to be considered as potential differential diagnoses (1).

Medical therapy of urolithiasis is often unsuccessful and in many cases surgical therapy is indicated. Urolithiasis with totally obstruction of the urinary tract or kidney diseases such as hydronephrosis make surgical intervention necessary. Depending on urolith size, location and the patients' status cystotomy, ureterotomy, nephroty, nephrectomy, pyelolithotomy, urethronephrotomy or urethrotomy are common surgical procedures for the treatment of urolithiasis. However, urinary tract surgery in rabbits, rodents and ferrets is challenging because of the small size of the patients (9). The surgical procedures will be demonstrated. Fluid therapy before and during surgery is recommended to correct any azotemia or dehydration. The patient has to be carefully monitored during fluid therapy to prevent fluid overload.

Postoperative complications include bleeding, hematuria or urine leakage into the abdomen, adhesions and strictures. Postoperative care is very important for a positive outcome of the surgical intervention. Therefore force feeding, analgesia, continued fluid therapy and monitoring of the urine output and urinalysis are necessary postoperatively (9).

Several measures to prevent urolith recurrence are currently under discussion in rabbits and guinea pigs, such as urine dilution, change of diet, improvement of husbandry and several types of medication. Improving the diet of patients with urolithiasis to a low calcium feed can be helpful to prevent urolith recurrence (8).

Conclusion

The knowledge of the various diseases, their typical symptoms and the possible diagnostic measures applicable in small mammals are necessary for a successful treatment of urinary tract diseases in rabbits, rodents and ferrets.

References
