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Review

Endoscopic examination of the urethra and the urinary bladder in dogs – indications, contraindications and performance technique

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Abstract

This paper discusses indications, contraindications, and likely complications following the endoscopic examination of the urethra and the urinary bladder in dogs. In addition, the procedure performance techniques and evaluation of the particular sections of the lower urinary tract are presented as well as the equipment used for the urethrocystoscopy.

Key words: urethroscopy, cystoscopy, dog

Introduction

Lower urinary tract diseases are a frequent problem in dogs. A clinical examination and such common diagnostic examinations as a blood count test, physicochemical examination of urine and urine sediment, microbiological examination of urine, and X-ray and ultrasound examination of the abdominal cavity do not always allow an ultimate diagnosis (Cannizzo et al. 2001). Endoscopic examination of the urethra and urinary bladder is a useful diagnostic technique which is more and more frequently used for diagnosing diseases of these organs. It enables evaluation of the inside of the organ as well as precise collection of material for further examination (Cannizzo et al. 2001, Henry 2003, Crow 2008).

Indications for endoscopic examination of the lower urinary tract

The most frequent indications for the endoscopic examination of the urethra and urinary bladder are as follows: urinary incontinence, pollakiuria, haematuria, painful urination, recurrent urinary tract infections, suspicion of urethrostenosis, chronic inflammations of the urinary bladder, suspicion of cystolithiasis, suspicion of ectopic ureters, suspicion of bladder diverticula, injuries of the urethra and urinary bladder, bleeding from the urogenital system unassociated with urination, suspicion of neoplastic tumours, polyps and cysts (Nicpoń and Kubiak 2000, Sapieryński 2000, Cannizzo et al. 2001, Patrick et al. 2006, Holak et al. 2007, Crow 2008).

Contraindications for endoscopic examination of the lower urinary tract

Contraindications for urethrocystoscopy are: a low haematocrit, considerably raised liver enzyme activity, high urea and creatinine levels, and cardiovascular system disorders. Such disorders increase the risk of complications connected with patient anaesthesia.

Medical equipment

Both rigid and flexible endoscopes may be used for the endoscopy of the urethra and urinary bladder in dogs. If flexible endoscopes are used, their diameter should be up to 3 mm for males and females of small and medium-size dog breeds, and for females of large dog breeds, up to 5 mm. The advantages of flexible endoscopes (Fig. 1) are fewer traumatic incidents



Fig. 1. Urethrerorenofiberscope 7.5 Fr in diameter, 67 cm in length, and a 3.6 Fr instrument channel.

during the examination of the organ and thorough observation of the inside of the urinary bladder thanks to the possibility of bending the cap of the endoscope in different directions; flexible endoscopes are thus preferred. Such endoscopes usually have an instrument channel through which it is possible to collect material by means of manipulators such as biopsy forceps and a cytology brush for further diagnostic examination. However, for urethrocystoscopy of females, rigid endoscopes which have similar parameters to those of flexible endoscopes, may also be used. A disadvantage of rigid endoscopes is their limited visual field, which makes the endoscopy of the urinary bladder particularly difficult and increases the possibility of injury of the organs during the examination. Addi-

tionally, it should be indicated that endoscopes with an instrument channel are preferred as they enable insertion of different manipulators by means of which material for further examination can be precisely collected e.g. specimens of mucous membrane for histopathological examination (Henry 2003, Messer et al. 2005).

Preparation of dogs and technique for endoscopic examination of the lower urinary tract

In veterinary medicine, endoscopic examination of the urinary system is performed under general anaesthesia and therefore it is important to qualify the patient for examination. This is done on the basis of clinical examination and blood count test (haematological and biochemical) results. During the clinical examination, attention should be paid to the colour of those mucous membranes which are accessible to examination, heart rate, the number of breaths and their quality, and internal body temperature. During biochemical examination of the blood, special attention should be paid to alanine aminotransferase (ALT) activity, aspartate aminotransferase (AST) activity, alkaline phosphatase (ALP) activity and urea and creatinine levels as this enables evaluation of the functions of the internal organs (especially the liver and kidneys). In geriatric patients, it is also essential to carry out cardiac examination. Before endoscopic examination of the lower urinary tract, the animals require an appropriate dietary preparation which includes 24-hour starvation and a 6-hour break from fluid administration. In males, the endoscopy of the urinary system is performed on an animal which is positioned either on the right or left side, whereas in females the urethrocystoscopy is performed on the animal with lateral, abdominal or dorsal recumbency. Some authors state that abdominal or dorsal recumbency is better for evaluation of the particular sections of the lower urinary tract (Cannizzo et al. 2001, Crow 2008). Preparation of dogs for examination is very similar to the insertion of a catheter into the urinary bladder. It consists in removing animal hair from the area of the vulva (female dogs) or prepuce (male dogs) and their disinfection. The endoscope is then inserted up to the urinary bladder through the external opening of the urethra. In female dogs, in order to better expose the external opening of the urethra, a special dilator can be used which is inserted into the vaginal vestibule. During examination it is essential that the bladder be filled as this enables stretching of its wall, thanks to which its mucous membrane may be examined thoroughly. Urine in the urinary bladder

can be used as a filling substance. If the urine is cloudy or stained with blood, it should be removed through the instrument channel of the endoscope or by means of catheter, and the bladder should be filled with air or physiologic saline heated to body temperature. In the course of the urethroscopy, attention should be paid to the appearance of the mucous membrane, its colour and surface (e.g. the presence of erosion, ulceration, proliferative lesions, and uroliths) should be evaluated. Prior to the insertion of the endoscope into the urinary tract, the area of the external opening of the urethra should be evaluated. Inflammations and neoplasms, in rare cases, are the most frequent abnormalities that can be found in this area.

Anaesthesia

The examination is performed under general anaesthesia. In the Endoscopy Laboratory of the Department of Internal Diseases with Clinic for Horses, Dogs and Cats, complex anaesthesia is applied, in which xylazine at a dose of 1 mg/kg of body mass and atropine at a dose of 0.05 mg/kg of body mass are used for premedication in one intramuscular injection. For the main anaesthesia, propofol at a dose of 4 mg/kg of body mass is used in an intravenous injection, and then at 2 mg/kg of body mass, according to the effect of the anaesthetic action. In addition, in order to apply local anaesthesia to the urinary tract, 2% lignocaine gel applied on the end of the endoscope is used.

Endoscopic evaluation

Urethra

The urethra is examined for proliferative lesions, uroliths, ectopic ureters, inflammations, stenosis, and mucous membrane injuries. The mucous membrane of the urethra has a physiologically smooth surface and a pale rose colour. In female dogs, the insertion of the endoscope through the urethra into the urinary bladder does not give rise to any difficulties. Difficulties may occur but only in male dogs, this is connected with the presence of the penile bone. Urethritis can be primary caused by infections, injuries, uroliths or catheterization (iatrogenic cause), or secondary – as a result of urinary bladder inflammation. In the case of urethritis, reddening of the mucous membrane, bleeding, erosion, ulceration, and excessive proliferation of tissue and adhesions (e.g. in the case of granular inflammation of the urethra) can be detected during endoscopic examination (Nikula et al. 1989,

Nicpoń and Kubiak 2000, Sapieryński 2000, Crow 2008). Endoscopic examination of the urethra also enables identification of potential stenosis. In the case of ectopic ureters, a basin shape of the ureter and its extension can be observed. However, when neoplastic process in the urethra is suspected, the character of changes should be evaluated (the extent, appearance, and grade of urethral stenosis) and biopsies should be collected for histopathological examination as this is the only way in which malignant and benign lesions can be differentiated (Cannizzo et al. 2001).

Urinary bladder

The urinary bladder is evaluated for the occurrence of congenital or acquired abnormalities such as diverticula, proliferative lesions (Fig. 3), uroliths (Fig. 2), erosion, ulceration, and inflammatory lesions of the mucous membrane (Fig. 4). Physiologically, the ostia of the ureters in the bladder are located on the border between the bladder neck and the body of the bladder on the dorsal side on the right and left sides. It should be remembered that if the patient is positioned in lateral or dorsal recumbency, the position of the ostia of the ureters changes. The ostia of the ureters have the form of small openings in the mucous membrane of the urinary bladder wall. If the bladder wall is extended too much by excessive filling e.g. with physiologic saline, it may be difficult to find the ostia of the ureters (Cannizzo et al. 2001, Messer et al. 2005). Physiologically, the mucous membrane of the urinary bladder has a smooth surface and a pale rose to grey-pink colour. Delicately marked blood vessels can also be seen (Maxie et al. 1993, Messer et al. 2005). Congenital abnormalities of the urinary bladder structure cover, for example, diverticula of the urinary bladder, which most often occur in the cranial-abdominal wall of the urinary bladder; they may look like small defects in the mucous membrane. Diverticula of the urinary bladder are usually accompanied by an inflammatory condition. Acute and chronic inflammation of the urinary bladder (*cystitis acuta et chronica*) and inflammation of the bladder caused by the application of cyclophosphamide (Maxie et al. 1993, Cannizzo et al. 2001) belong to those urinary bladder diseases which are diagnosed most frequently during endoscopic examination. A distinctive feature of urinary bladder inflammation in the endoscopic image is oedema of the mucous membrane and an increase in the number of blood vessels, which have a more winding run. The mucous membrane of the urinary bladder is more fragile in the inflammatory condition, which manifests itself as a tendency to bleed when the endoscope contacts with surface.

Thickening of the mucous membrane of the urinary bladder sometimes causes a decrease in its transparency and tensibility. In the case of the presence of TCC – transitional cell carcinoma in the urinary bladder (Fig. 5) its most typical location is the area of the trigone of the bladder (Walter et al. 1984, Schwarz et al. 1989, Nikula et al. 1989, Norris et al. 1992, Maxie et al. 1993, Sapierzyński 2000, Glickman et al. 2004). During endoscopic examination, when this type of cancer occurs, very characteristic changes are observed i.e. cauliflower-like proliferation bulging into the lumen of the urinary bladder can be noticed. Other neoplasms which may occur in the urinary bladder are: adenocarcinoma, poorly differentiated cell carcinoma, papilloma, fibroma, and leiomyoma (Schwarz et al. 1989, Maxie et al. 1993, Sapierzyński 2000, Patrick et al. 2006).

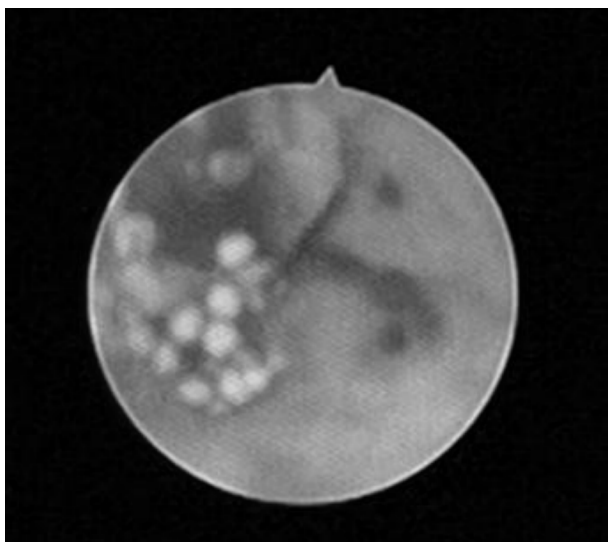


Fig. 2. Urolith inside the urinary bladder.

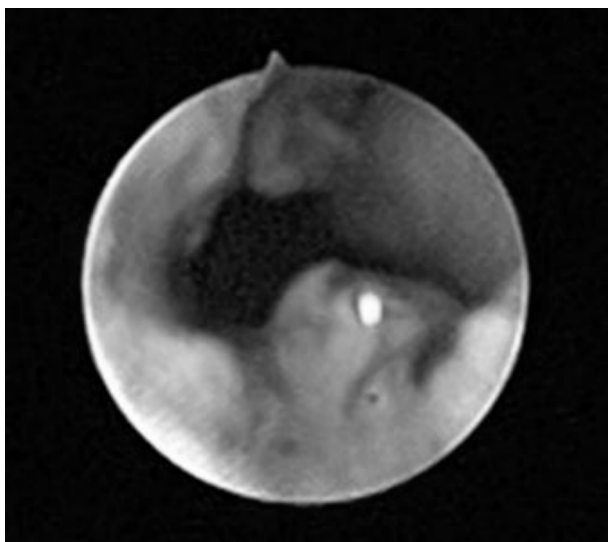


Fig. 3. Proliferative lesion in the area of the trigone of the urinary bladder.

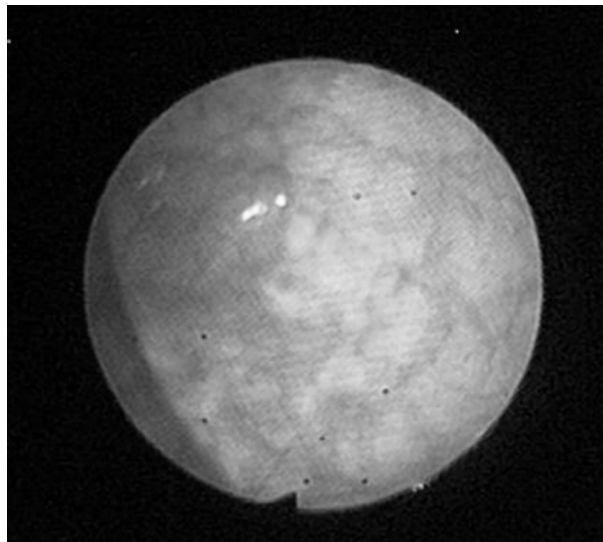


Fig. 4. Inflammatory changes inside the urinary bladder.

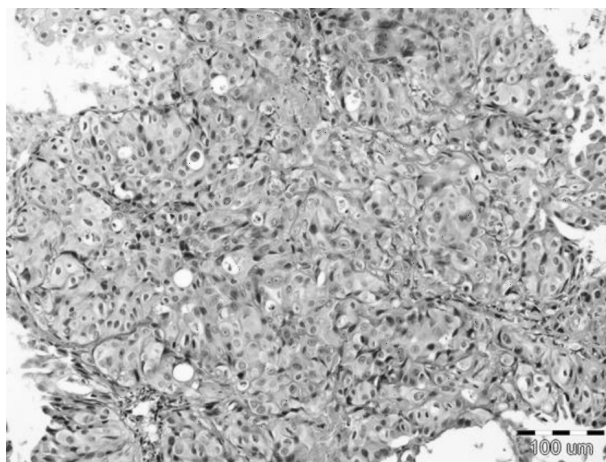


Fig. 5. Histopathology: carcinoma urotheliale invasivum, High Grade (G2) HE staining, 400x.

Complications after urethrocystoscopy

Frequency and type of complications which arise after endoscopic examination of the lower urinary tract depend on the size of the animal examined, the equipment, and experience of the individual who carries out the examination. The most frequent complications are:

- perforation of the urethra or the urinary bladder – if inappropriate sizes of endoscopes have been used,
- microscopic or macroscopic haematuria caused by damage to the inflamed mucous membrane of the urethra or the urinary bladder,
- infections of the urinary tract may result from careless disinfection of the endoscopic equipment and secondary transmission of bacteria from the urethra to the urinary bladder.

Conclusion

Summing up, may be stated that endoscopic examination of the urethra or the urinary bladder is a safe and very useful diagnostic technique for diagnosis of diseases of the urethra and urinary bladder. It enables direct observation of the organs and thus allows determination of pathological changes which develop in the mucous membrane. In addition, if the urethrocystoscopy is performed by means of an endoscope with an instrument channel, it is possible to collect material for further examination (e.g. histopathological examination), which makes the diagnosis more precise and has an influence on further treatment and prognosis.

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