RESEARCH ARTICLE

Comparison and evaluation of the lower urinary tract diseases radiographic, ultrasonographic diagnosis and cystoscopic examination findings in dogs

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Abstract

In this study, 12 dogs clinical cases of various ages, races and genders, with complaints of lower urinary tract diseases which brought to the Animal Hospital of Ankara University Faculty of Veterinary Medicine were evaluated with radiography, ultrasonography and cystoscopy. After anamnesis, bi-directional direct radiograms were taken and contrast radiography was decided in some of the cases, when needed. Positive contrast or double contrast radiographies were decided according to the indications of the cases. Urinary tracts of the dogs were evaluated with abdominal ultrasonography and according to the findings, endoscopic examination was performed. All the dogs were evaluated with Transurethral Cystoscopy. There were 2 cases of urothiasis and petechial hemorrhage in urethra and vesica urinaria, 1 case of bladder neoplasia, 3 cases of petechial hemorrhage in urethra and vesica urinaria, 2 cases of chronic cystitis and 4 cases had no pathology. In two cases with urolithiasis, stones could be identified with all three imaging techniques. In the case of bladder neoplasia, the tumor formation which can not be determined by radiographic direct x-ray was detected by double contrast cystography. The neoplasia in this case could also be observed by ultrasonography and cystoscopy. Three cases with chronic cystitis could be diagnosed by all three imaging techniques. Bleeding areas in three cases with petechial hemorrhage in the urethral mucosa and vesica urinaria could only be determined by cystoscopy. In conclusion, diseases of the urinary bladder in dogs were evaluated by radiography, ultrasonography and cystoscopy, respectively. Cystoscopy was determined to be far superior to other diagnostic methods. The findings provided important information for researchers and clinicians and a major contribution for our endoscopy unit to come to international norms.

Keywords: Cystoscopy, diagnose, dog, radiography, ultrasonography.

1. Introduction

Cystoscopy or uroendoscopy is visualization of the urethra, urinary bladder and the areas of ureters’ entrance into the urinary bladder using the optical fiber system. Cystoscopy is a rapid examination of the definite diagnosis of urethral and urinary bladder diseases as well as anatomic abnormalities of the lower urinary tract and, when necessary, treatment [1, 6, 7, 16]. Cystoscopy is used in human medicine for more than 100 years. The first cystoscopy technique in dogs was described by Vermooten in 1930, but the study of small animals seen in the literature in the mid-1980s. Clinical use in cats was not found in literature until 1986. After this year, studies can be found in literature about both cats and dogs [16, 18].

2. Material and Methods

In this study, 12 dogs of various age, race and gender were evaluated. The dogs were sent for radiographic, ultrasonographic and cystoscopic examination to Ankara University Veterinary Faculty Surgical Department Clinic. For radiographic examination, dynamic brand DR system in Surgical Department was used. Ultrasonographic examinations were performed with ESAOTE - AU5 color doppler device and 3.5, 5 and 7 Mhz multifrequency convex and 7,5 and 10 Mhz linear probes were used which feature on this device with. The MGB Disto II recorder was used to record the images obtained at the end of the ultrasonographic examination. For cystoscopic examination, Karl Storz brand flexible 5 Fr. cysto-fiberscope Transurethral Cystoscopy (TUC) was
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used. Karl Storz brand Telecom SL II camera unit and Veterinary Video camera III model endoscopic camera to view and record cystoscopy process, Xenon nova 175 LED-battery light source, charge, Li-on Battery Charger, Foreseeson Fs-L1901 D model medical monitor and Dexonic BT-3548 HR model Full HD recorder were used. Cystoscopic examination was performed under inhalation anesthesia. For this purpose, Neptune automatic ventilated SMS 2000 Classic model anesthesia device in Surgical Department was used with the Shei Isoflurane vaporizer on it. Routine clinical examinations of dogs were performed after receiving anamnesis. Then radiographs were taken in the right lateral position for direct radiographic examination and ventro dorsal position in necessary cases. A contrast radiographic examination was decided according to the findings obtained at the end of the direct radiographic examination. One of the positive or double contrast examination methods was selected for contrast examination according to its indication. Xenetix® 300 ml (Guerbet / France) nonionic iodinated contrast medium was the preferred contrast medium. In the positive contrast cystography method; retrograde urinary catheters were applied and firstly urine bladder emptied. Then, the contrast material was injected into the bladder until a pressure developed in the sac and after radiographs were taken in the right lateral position. Radiographs were taken in the ventrodorsal position when necessary. In the double contrast cystography method, 5 to 15 ml of positive contrast material according the size of the animal was administered by the same method to the animals which retrograde urinary catheter was applied and urine drained. Massage was applied externally to the bladder to allow homogenous distribution of the drug into the urinary bladder. The remaining contrast material was withdrawn as much as possible with the urine, and then room air was injected into the urinary bladder as negative contrast agent. Radiographs were taken in the right lateral position and this procedure continued until the pouch had sufficient tension. Radiographs were taken at the ventrodorsal position in the required cases. After radiographic examinations, abdominal ultrasonography examinations of the dogs which included to the study were performed and the whole urinary system was evaluated. To obtain a clear image on the ultrasonography, the animals positioned dorsoventrally and the hairs in the prepelvic areas of the animals were shaved. Ultrasonography examination was performed on the sagittal and transversal plane of the urinary bladder with 7.5 and 10 MHz linear and 3.5, 5 and 7 Mhz convex multifrequency probes. The patients were then prepared for cystoscopy. Cystoscopic technique was performed with premedication of the patient. The dogs were premedicated with intravenous Fentanyl (Fentanyl citrate 50 μg / ml ampoule (Antigen Pharmaceuticals, Ireland), anesthesia induction was maintained with intravenous Propofol (Pofol ™ Propofol 200 mg / 20 ml Injection (Dong Kook Pharm.Co. Ltd/Korea). In transurethral cystoscopy method the patient was placed dorsoventrally. The cystoscope firstly was inserted through the orifice urethral externum. After entering the urethra, the urethral lumen was expanded with a saline or lactate ringer solution through the equipment channel of cystoscope and started to be examined. Urethra was evaluated for urethral mucosa, urethral obstruction, local narrowing, and then cystoscope entered to the urinary bladder. The urinary bladder was irrigated with saline through the cystoscope. The urinary bladder was filled with liquid again until the urinary bladder completely filled (the urinary bladder was palpated from the outside) and the urinary bladder was started to be examined while filling.

3. Results and Discussion

Radiographic, ultrasonographic and cystoscopic evaluations of the dogs are given in Table 1.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Age</th>
<th>Sex</th>
<th>Anamnesis</th>
<th>Radiographic examination</th>
<th>Ultrasonography examination</th>
<th>Cystoscopy Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mix</td>
<td>8 years old</td>
<td>♂</td>
<td>Stranguria hematuria</td>
<td>The urinary bladder could not be evaluated because it was empty</td>
<td>Urinary bladder had a normal appearance. An increase in prostate parenchyma echogenicity was observed</td>
<td>The urethras and urinary bladders mucous membrane had a normal appearance</td>
</tr>
<tr>
<td>(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boxer</td>
<td>7 years old</td>
<td>♂</td>
<td>Stranguria hematuria</td>
<td>Radiopaque stones were observed in the urinary bladder</td>
<td>Stones were observed in the urinary bladder lumen</td>
<td>Stone formations were observed. Petechial hemorrhage areas were observed in the urinary bladder mucosa</td>
</tr>
<tr>
<td>(2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Clinic data of the cases.
<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Gender</th>
<th>Diagnosis</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germ shep hard (3)</td>
<td>9 years old</td>
<td>♂</td>
<td>Pollakuria hematuria</td>
<td>Urinary bladder evaluated as normal</td>
</tr>
<tr>
<td>Germ shep hard (4)</td>
<td>2 years old</td>
<td>♀</td>
<td>Hematuria</td>
<td>Filling defects were identified in the bladder mucosa in double contrast cystography</td>
</tr>
<tr>
<td>Gold retriever (5)</td>
<td>12 years old</td>
<td>♀</td>
<td>Anorexia, hematuria, vomiting</td>
<td>Tumoral formation were identified in the bladder mucosa in double contrast cystography</td>
</tr>
<tr>
<td>Labrador dor (6)</td>
<td>9 years old</td>
<td>♂</td>
<td>Dysuria, hematuria</td>
<td>The urinary bladder could not be evaluated because it was empty</td>
</tr>
<tr>
<td>Germ shep hard (7)</td>
<td>10 years old</td>
<td>♂</td>
<td>Hematuria</td>
<td>The urinary bladder evaluated as normal</td>
</tr>
<tr>
<td>Mix (8)</td>
<td>5 years old</td>
<td>♂</td>
<td>Pollakuria hematuria</td>
<td>Urinary bladder was observed as more radiopaque than normal</td>
</tr>
<tr>
<td>Kangal (9)</td>
<td>7 years old</td>
<td>♂</td>
<td>Hematuria</td>
<td>Urinary bladder was observed as more radiopaque than normal</td>
</tr>
<tr>
<td>Terrier (10)</td>
<td>12 years old</td>
<td>♀</td>
<td>Hematuria vomit</td>
<td>Growth in the kidneys was observed. Urinary bladder had a normal appearance</td>
</tr>
<tr>
<td>Mix (11)</td>
<td>6 years old</td>
<td>♂</td>
<td>Pollakuria hematuria</td>
<td>The wall thickness of the urinary bladder was increased and crystal accumulations were observed</td>
</tr>
<tr>
<td>Doberman (12)</td>
<td>9 years old</td>
<td>♀</td>
<td>Stranguria hematuria</td>
<td>Radiopaque stones were observed in the urinary bladder</td>
</tr>
</tbody>
</table>

Comparing to other diagnostic techniques, cystoscopy has many advantages. Urethral output, urethra, urinary bladder, and urethral openings are visualized non-invasively directly via optic wire. The imaging of these structures is much better than other diagnostic methods due to telescopic magnification and excellent illumination with cystoscopy [3,5]. Radiographic, ultrasonographic and cystoscopic evaluations were performed on lower urinary system diseases in the study. Compared to these three techniques, the method of cystoscopy, which makes visible even small lesions in the urethra and in the urinary bladder, is far superior. Because of the breadth and extent of lower urinary tract pathologies, their evaluation is done by cystoscopy [1,2,4,7,8,16]. In cases where cystitis does not respond to medical treatment or can not be diagnosed definitively, cystoscopy is indicated.
Comparison and evaluation of the lower urinary tract diseases radiographic, ultrasonographic diagnosis and cystoscopic examination findings in dogs

in the evaluation of chronic cystitis [17]. In case of chronic cystitis contrast radiography or ultrasonography is also used. However, cystoscopy provides much more accurate information than these diagnostic methods. Radiographic evaluation of the dogs evaluated in this study and diagnosed as cystitis was insufficient except stone formations. However, in the 5th case, tumoral formation was visualized by double contrast cystography. Ultrasonographic evaluation revealed the lumen and the wall thickness of the urinary bladder, the stones formations and cause of hematuria could be evaluated and determined. However, with cystographic evaluation and telescopic enlargement of the cystoscope, both the urethral and the urinary bladder haemorrhagic lesions can be visualized, and these lesions can be biopsied and the stones can be removed. Cystoscopy was found superior to other diagnostic methods in determining the shape, size and location of the lesion in lower urinary tract diseases. Most urinary tract pathologies can be evaluated by cystoscopy [1,2,8,11,12]. Mucosal tumors can be seen. Biopsy specimens for histopathological examination, culture and sensitivity studies can be taken from cyst wall by cystoscopy [3,10,15]. In case number 5, biopsy was taken and pathological evaluation was made. Transient cell carcinoma (TCC) was identified in the biopsy (Figure 1). With this method, which is easy to manipulate, biopsy can be easily taken and it has come to the conclusion that cystoscopy is more functional than other diagnostic methods when it has come to taking biopsy.

Figure 1. Transient cell carcinoma (TCC)

In cases of cystic and urethral stones; tenesmus, hematuria, chronic cystitis, urine flow changes happen. Cystoscopy is used to determine the exact diagnosis, information about the prognosis of the disease and the method of treatment. Cystoscopy should be done again if stone is found on the radiograph without any clinical symptoms. If the stones are small pieces, they could be removed with the aid of cystoscopy without incision of urinary bladder is made. Large stones can be removed with the aid of cystoscopy after they are separated by small pieces by lithotripsy [10]. Hematuria was observed in all the cases where the stone was observed radiographically in the dogs and the exact location of the stones could be determined by cystoscopy. In the 2nd case the stones could be taken via cystoscopy, but there were many and large stones in the 12th case and because of absents of the necessary equipment for the lithotripsy method, the stones could not be broken down and the stones had been taken by open method (Figure 2).

Figure 2. Calculli
Cystoscopy or cystourethroscopy is indicated for chronic hematuria or acute serious hematuria. Hematuria due to many different etiologies can be located only with cystoscopic examination, and it can be determined whether the cause of the bleeding is tumor, stone or urethral origin [2,9,16,17,18]. Stone, polyp, tumoral formation, and cystitis-induced hemorrhages were fully observed and definitively diagnosed with the cystoscopy. Ultrasound provided more information about canine hematuria, especially those related to prostate diseases. The idea has been reached that the exact source of hematuria should be determined with use of these two techniques. In dogs with cystitis or urethritis, animals urinate by stretching and forcing themselves. Apart from this, urethral stones, prostate diseases, neurological diseases and urethral obstruction can cause difficulty urinating. These various etiologies are diagnosed by cystoscopy or urethroscopy [13,14,15]. Pollakuria is usually a symptom of a lower urinary tract disease. Polyuria can be a symptom of many conditions. In dogs with urinary stones, case number 2 and 12, pollakuria and stranguria were observed. The diagnosis of these diseases was also made by ultrasonography. From these results, it should also be investigated whether there is a kidney-related pathology in patients with stranguria, dysuria, and pollakuria.

5. References

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