USE OF PREPUBIC MINILAPAROTOMY IN THE CONGENITAL URETERAL ECTOPIA TREATMENT OF DOGS

PIOTR TREBACZ, PIOTR JURKA, AND MAREK GALANTY

Department of Clinical Sciences, Faculty of Veterinary Medicine, Warsaw University of Life Sciences (SGGW), 02-776 Warsaw, Poland
piotr_trebacz@sggw.pl

Received for publication September 1, 2009

Abstract

The aim of this study was the assessment of the usefulness of the limited approach to the abdominal cavity (prepubic minilaparotomy) in intramural ureteral ectopia treatment in dogs. Five spayed bitches, from 2 to 8 years of age, with diagnosed congenital ureteral ectopia, were surgically treated. In three cases ectopia was diagnosed in the left ureter, and in remaining two cases in the right one. In the basic physical examination, the general state of the dogs was normal. In detailed examinations, chronic dermatitis and hyperpigmentation at the region of vulva and of thigh rear surface, resulting from their contact with leaking urine, were found in all individuals. In urographic examination, typical changes for ureteral ectopia were found. The surgeries were performed under general anaesthesia. The abdominal cavity was open by medial prepubic 5 cm incision. After dislocation of the bladder outside the abdominal cavity, its lumen was exposed via a ventral cystotomy. After the opening of the bladder, ectopic ureter was localized and a form of ectopia was diagnosed. Further stages of the surgery, aiming at replantation of ectopic ureter, were performed according to the conventional ureteroneocystostomy technique. During postoperative period, fast abatement and mitigation of urinary incontinence symptoms were observed in all the dogs. On the basis of the achieved effects, it can be stated that prepubic minilaparotomy is able to replace the standard operative approach, utilised while replanting ureters in bitches.

Key words: dog, ureteral ectopia, minilaparotomy.

Congenital ureteral ectopia is the most frequent reason for early urinary incontinence in dogs since birth or weaning (6). The reasons for ectopia development can be hereditary factors and/or vitamin imbalance in a dam (9). There are two types of ureteral ectopia: intramural and extramural. One-sided intramural ectopia is more commonly diagnosed in dogs (the ureter enters the bladder wall in a normal anatomic position, but a portion of it extends submucosally within the bladder wall before it enters the urethral lumen) (3, 6, 9).

Effective treatment of ectopia requires surgical correction of the diseased ureteral orifice. In the case of intramural ectopia stomatisation of the ectopic ureter at the level of the bladder, trigone (neoureterostomy) or its replantation (ureteroneocystostomy) can be done.

The conventional surgical approach, utilised for ureteral ectopia treatment in small animals, requires the wide opening of the abdominal cavity by incision that runs from umbilicus to pubic symphysis (6). In human beings, it is possible to perform a curved incision in the inguinal region, a prepubic V-shape incision or a horizontal or median incision in the infraumbilical region (2). In order to limit the traumatism of such surgery, attempts are made to treat ureteral ectopia using minimally-invasive techniques, e.g. by laparoscopic or endoscopic methods. So far, only one report regarding the performing of endoscopic neoureterostomy in dogs has been published (3). Laparoscopic ureteroneocystostomy in small animals has not been described till now. It has been described as experimental surgery in pigs (5) and in medical literature one can find studies that concern individual cases or small groups of patients operated on in this way (8). The ureters are small and delicate structures and their laparoscopic replantation requires from a surgeon a great experience in performing such procedures (8). Apart from that, in case of veterinary medicine costs of purchase and operation of an appropriate instrumentarium have a considerable significance (3, 14, 15).

Ashley and Vandersteen (1) described replantation of the ureters with application of limited approach to the abdominal cavity (minilaparotomy) in children. It can be an alternative for laparoscopic surgery. In medical literature, a lot of studies comparing laparoscopy with minilaparotomy have been published. They concern, among others, pelvic lymphadenectomy (11), prostatectomy (16), and cholecystectomy (17). Their authors achieved similar effects using both the methods, noting at the same time, that minilaparotomy is much cheaper and simpler for performing. The number
of intraoperative complications was also smaller in case of minilaparotomy what was connected with necessity of having great experience in performing laparoscopic surgery.

So far, effects of clinical application of limited approach to the abdominal cavity in ureteral ectopia treatment in small animals have not been presented in available literature. Therefore, the aim of this study was the assessment of the usefulness of prepubic minilaparotomy in intramural ureteral ectopia treatment in dogs.

Material and Methods

From January 2008 till March 2009, five spayed bitches, from 2 to 8 years of age (average 5 years), of body weight from 26 to 36 kg (average 30 kg) with diagnosed congenital ureteral ectopia were surgically treated. The dogs represented three breeds: Labrador retriever, golden retriever and collie.

During the first visit, dogs were subjected to general clinical examination and a basic examination of peripheral blood and urine. In following stage, a detailed examination of the urinary system, completed by intravenous urography (excretory urography), was performed.

Urographic examination was done in dogs positioned in the right lateral, right oblique, left oblique, and dorsal recumbency, according to the standard technique (4). Iohexol (Omnipaque; Amersham Health) injected intravenously in the volume of 2.3 ml/kg b.w., what corresponded with 0.805 l/kg b.w., was used as a contrast medium.

Final confirmation of ureteral ectopia was done during the intraoperative examination. The surgeries were performed under general anaesthesia (isoflurane - Aerane; Baxter) with endotracheal intubation.

Follow-up examinations of the treated dogs were performed 10, 30, 60, and 180 d after the surgery. Follow-up intravenous urography was done 60 d after the surgery.

Surgical technique. After arrangement in dorsal recumbency and preparation of the operation field, each animal was catheterised and urine was removed from the bladder. The abdominal cavity was opened by medial prepubic incision, running to the region of last pair of mammary glands. After the cutting of the linea alba, the wound was extended by Weitlaner self-retaining retractor. After dislocation of the bladder outside the abdominal cavity, its neck and ureters were identified. Then, the bladder’s lumen was exposed by a longitudinal incision running through the distal part of the body, the neck and the proximal part of the urethra. After opening the bladder, the ectopic ureter was localised and the kind of ectopia was diagnosed. Further stages in the surgery, aiming at replantation of ectopic ureter, were performed according to conventional ureteroneocystostomy technique (6, 9).

Ureterovesical anastomosis was done by interrupted, monofilament, absorbable sutures from glycomer 631 (Biosyn 5-0; Syneture). The bladder and urethra were closed by a single continuous suture non-penetrating mucous membrane (Biosyn 3-0). After introducing the bladder into the abdominal cavity, the operative wound was closed laterally in the standard manner.

In the postoperative period, each animal was administered: 4 mg/kg b.w./24 h. (s.c., for 3 d) of tolfenamic acid (Tolfine; Vetoquinol) and 7 mg/kg b.w./24 h of amoxicillin with 1.75 mg/kg b.w./24 h of clavulanate (Synergal; Scanvet) (s.c., for 5 d).

Results

In the preoperative period, urinary incontinence occurred in all animals. The dogs were at that time pharmacologically treated due to post-spaying (acquired) urinary incontinence and recurrent episodes of urinary tract infections. The dogs were periodically administered phenylpropanolamine, oestradiol, and some antibiotics. Such treatment brought only short-lasting remission of the observed clinical symptoms.

In the basic physical examination, the general state of the dogs was normal. In detailed examination, chronic dermatitis and hyperpigmentation at the region of vulva and of thigh rear surface, resulting from their contact with leaking urine, were found in all individuals. In biochemical and morphological examinations of peripheral blood and in the general examination of urine, no changes were found as opposed to reference values (18) (Tables 1 and 2).

In urographic examinations typical changes for ureteral ectopia were found. Ectopic ureters were widened and they entered into the urethra (Fig. 1).

In three cases, ectopia was found in the left ureter, and in remaining two cases in the right one. During intraoperative examinations, the findings of urographic examinations were confirmed by diagnosing intramural ectopia in all the dogs. Operative incision, that enabled the performing of surgery, amounted to 5 cm (Fig. 2).

In none of the operated-on bitches complications connected with general anesthesia or with applied operative technique occurred. The animals were given back to the owners on the day of the surgery, after full recovery from general anesthesia. Operative wounds healed per primam in all the animals. During the postoperative period fast abatement and mitigation of urinary incontinences symptoms were observed in all the dogs (Table 3).

Regular radiological picture of the replanted ureters and the bladder were observed in control intravenous urography (Fig. 3).
### Table 1
Summary of the peripheral blood analysis in treated dogs

<table>
<thead>
<tr>
<th>Case</th>
<th>RBC ((10^9/L))</th>
<th>Haematocrite ((L/L))</th>
<th>WBC ((10^9/L))</th>
<th>Platelets ((10^9/L))</th>
<th>AST ((U/L))</th>
<th>ALT ((U/L))</th>
<th>Glucose ((mmol/L))</th>
<th>Creatinine ((\mu mol/L))</th>
<th>Urea ((mmol/L))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.2</td>
<td>47</td>
<td>12</td>
<td>380</td>
<td>30</td>
<td>32</td>
<td>5.9</td>
<td>100</td>
<td>3.4</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>43</td>
<td>11.9</td>
<td>203</td>
<td>38</td>
<td>43</td>
<td>5</td>
<td>132</td>
<td>5.9</td>
</tr>
<tr>
<td>3</td>
<td>5.62</td>
<td>40</td>
<td>9.7</td>
<td>376</td>
<td>29</td>
<td>40</td>
<td>6.3</td>
<td>130</td>
<td>6.5</td>
</tr>
<tr>
<td>4</td>
<td>5.7</td>
<td>40</td>
<td>12.4</td>
<td>200</td>
<td>32</td>
<td>46</td>
<td>4.2</td>
<td>90</td>
<td>3.5</td>
</tr>
<tr>
<td>5</td>
<td>5.77</td>
<td>39.2</td>
<td>10</td>
<td>202</td>
<td>23.5</td>
<td>52</td>
<td>6</td>
<td>150</td>
<td>6.8</td>
</tr>
<tr>
<td>Ref.val.</td>
<td>5.5-8.0</td>
<td>37-55</td>
<td>6-16.5</td>
<td>200-580</td>
<td>1-37</td>
<td>3-50</td>
<td>3.9-6.7</td>
<td>88.4-150.3</td>
<td>3.32-7.47</td>
</tr>
</tbody>
</table>

### Table 2
Summary of voided urine analysis in treated dogs

<table>
<thead>
<tr>
<th>Case</th>
<th>Colour</th>
<th>Transparency</th>
<th>Specific gravity</th>
<th>pH</th>
<th>Protein</th>
<th>WBC</th>
<th>RBC</th>
<th>Epithelial cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>yellow</td>
<td>clear</td>
<td>1.015</td>
<td>5.5</td>
<td>-</td>
<td>3-5</td>
<td>1-2</td>
<td>0-2</td>
</tr>
<tr>
<td>2</td>
<td>yellow</td>
<td>slightly hazy</td>
<td>1.02</td>
<td>6</td>
<td>-</td>
<td>3-5</td>
<td>3-4</td>
<td>1-3</td>
</tr>
<tr>
<td>3</td>
<td>yellow</td>
<td>clear</td>
<td>1.02</td>
<td>6.5</td>
<td>+/-</td>
<td>4</td>
<td>0-1</td>
<td>0-3</td>
</tr>
<tr>
<td>4</td>
<td>yellow</td>
<td>slightly hazy</td>
<td>1.03</td>
<td>6.5</td>
<td>+/-</td>
<td>2-4</td>
<td>2-3</td>
<td>0-3</td>
</tr>
<tr>
<td>5</td>
<td>yellow</td>
<td>hazy</td>
<td>1.04</td>
<td>6.5</td>
<td>+/-</td>
<td>4</td>
<td>3-4</td>
<td>1-3</td>
</tr>
<tr>
<td>Ref.val.</td>
<td>yellow</td>
<td>clear</td>
<td>1.016-1.045</td>
<td>&lt; 6</td>
<td>-</td>
<td>few</td>
<td>few</td>
<td>few</td>
</tr>
</tbody>
</table>

### Table 3
Summary of treated dogs with ureteral ectopia

<table>
<thead>
<tr>
<th>Case</th>
<th>Breed</th>
<th>Age (years)</th>
<th>Weight (kg)</th>
<th>Time of spaying</th>
<th>Ectopic ureter</th>
<th>Postoperative examination day 10</th>
<th>Postoperative examination day 30</th>
<th>Postoperative examination day 60</th>
<th>Postoperative examination day 180</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Labrador retriever</td>
<td>2</td>
<td>26</td>
<td>after 1st oestrus</td>
<td>left</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Labrador retriever</td>
<td>3</td>
<td>30</td>
<td>after 2nd oestrus</td>
<td>left</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Labrador retriever</td>
<td>5</td>
<td>28</td>
<td>after 1st oestrus</td>
<td>right</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>Collie</td>
<td>7</td>
<td>30</td>
<td>after 3rd oestrus</td>
<td>right</td>
<td>-</td>
<td>-</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>5</td>
<td>Golden retriever</td>
<td>8</td>
<td>36</td>
<td>after 2nd oestrus</td>
<td>left</td>
<td>-</td>
<td>-</td>
<td>+/-</td>
<td>+/-</td>
</tr>
</tbody>
</table>

(+) - urinary continence
(-) - urinary incontinence
(+-) - episodes of urinary incontinence
Fig. 1. Case 2; preoperative urography (red arrow-left ectopic ureter).

Fig. 2. Case 2 (postoperative view); closed surgical wound (red arrows – rostral and caudal margin of the wound), (dog’s head on the right).

Fig. 3. Case 2; postoperative urography (red arrow-left replanted ureter).
Discussion

Confirmation of the presence of ureteral ectopia can be obtained on the basis of the findings of intravenous urography, uro-CT (3), ultrasonography, urethrocystoscopy (3, 6, 9), or scintigraphy (7). The most common of these methods and mostly used in our centre is intravenous urography. This examination is simple to perform, cheap, and well tolerated by examined animals. In doubtful or difficult-to-interpret cases, it can be supported by pneumocystography (4). Additional filling of the bladder with gas (negative-contrast medium), facilitates the identification of the ureters’ openings. In the presented material, intravenous urography resulted in the sufficient and correct diagnosis of ureteral ectopia in all treated animals.

On the basis of the achieved effects, it can be assumed that prepubic minilaparotomy is able to replace the standard operative approach, utilised while replanting the ureters in bitches. The presented method combines the advantages of minimally-invasive therapy with the effectiveness and security of conventional surgery. The possibility of performing ureteroneocystostomy by using typical instruments considerably reduces the risk of intra- and post-operative complications.

In a similar way, Rawlings (14) operated on two dogs with inflammatory polyps of the urinary bladder. He made a minilaparotomy of 2.5 cm length after previous performing of a cystoscopic examination using the prepubic approach, then dislocated the bladder outside the abdominal cavity and excised the affected areas of the urinary bladder in the conventional manner, using standard surgical instruments.

Röcken et al. (15) surgically treated four horses with urolithiasis in similar way. At first, they localised and fixed the urinary bladder at the abdominal cavity region applying laparoscopic technique, then they performed minilaparotomy and drew the bladder outside. In the following stage of the surgery, they removed urinary stones in the conventional way. The urinary bladder was introduced to the place after its tight suturing only.

In human medicine such an operating method is applied, among others, while performing colectomy. Nakagoe et al. (12) operated on 102 patients with colon cancer, doing a minilaparotomy of 7 cm length. Resection of the affected bowel segment and reconstruction of the alimentary tract continuity were carried on outside the patients’ abdominal cavity, engaging the conventional surgical technique and standard surgical instruments. The authors of this paper draw attention to the much greater security and comfort of performing alimentary tract anastomosis by the conventional method in comparison with the laparoscopic procedure.

Minilaparotomy is defined as the shortest possible incision of the abdominal cavity wall that enables the conducting of the intended operation (13). Röcken et al. (15) conditioned the length of the performed incision (amounting 8-10 cm) on the dimension of concretions that occur in the urinary bladder. In our clinical material, the opening of the abdominal cavity was sufficient at the segment of 5 cm. This incision was twice as long as that done by Rawlings (14), but in the case of our patients there was the necessity of securing a free approach to the urinary bladder neck, with the possibility of its inversion while localising and cutting off the ectopic ureter. The additional use of a self-retaining retractor, that extended the operative wound margin, considerably increased the comfort of the performed surgeries.

The choice of ureter replantation as the treatment method for the intramural ureteral ectopia was connected with the own experience of the authors of this study. In our opinion, ureteroneocystostomy is easier than neoureterostomy. Proper surgical technique and delicate handling of the replanted ureter prevent such complications as anastomotic dehiscence, loss of ureteral peristalsis and stenosis of the ureterovesicular junction.

The course of the disease and the observed clinical symptoms that occurred in the treated animals did not differ in essential way from those that have been described in literature up to now. The absence of urinary tract infection in laboratory examinations (as a rule accompanying ureteral ectopia), probably resulted from antibiotic application in our patients during preoperative period. Quite atypical for these animals was also probable average age of the operated-on bitches, amounting to as many as 5 years. According to Fossum (6), probable average age of bitches in which ureteral ectopia is diagnosed is 10 months. The reason of for so high average age in the treated animals was probable incorrect diagnosis of acquired urinary incontinence and attempts at the pharmacological treatment of this disease. Post-spaying urinary incontinence is the most frequent remote complication of surgical castration in bitches. It happens in over 20% of spayed bitches and in the case of animals with over 30 kg body weight, the percentage of individuals with this problem increases to over 30%. In differential diagnosis of acquired urinary incontinence, ectopic ureters should be taken into consideration (10). Affected dogs with ureteral ectopia may have some response to pharmacological treatment, mimicking dogs with post-spaying urinary incontinence (6). Regression or substantial mitigation of urinary incontinence symptoms after performing ectopic ureter replantation indicates that the reason for the disease was ureteral ectopia in the animals treated by us. Six months after surgery, mild symptoms of urinary incontinence occurred in two of the oldest dogs only (cases 4 and 5). This could result from disturbances in the function of the urethral sphincter mechanism, damaged by so long a presence of ectopic ureter. According to Fossum (6) and Holt (9), such a problem may occur in 30%-55% of treated animals and according to Berent et al. (3) even in 78%.

It should be remarked, in conclusion, that minilaparotomy and replantation of the ureter conducted outside the abdominal cavity are easy to perform and they are well tolerated by treated animals. Owing to performing small dimensions of performing operative wound, the danger of evisceration or postoperative
hernia incident is limited to the minimum. In the case of intraoperative complications, fast conversion to conventional surgical approach is possible.

References


