Ectopic ureters in the cat – a report of two cases

W. J. BIEWENGA*, J. ROTHUIZEN* AND G. VOORHOUT†

*Small Animal Clinic and †Department of Veterinary Radiology of the State University of Utrecht, The Netherlands

ABSTRACT
Two cases of ectopic ureters in cats are described. In both the male and the female cat urinary incontinence was the prominent feature. Diagnosis was made by excretion urography. In both cats the ectopia was bilateral. The ureters were surgically reimplanted in the bladder, which gave total relief of the incontinence. A follow-up study is described, and the results are discussed.

INTRODUCTION
Ureteral ectopia is a congenital condition in which one or both ureters do not drain into the bladder. This disorder, which causes continuous dribbling of urine, occurs quite often in the female dog, but as a clinical feature it has only once been described previously in a cat (Bebco, 1977) and one case of an ectopic ureter in a female cat discovered by routine laboratory dissection has been reported (Reis, 1959).

The following is a report of two cases of this abnormality in cats which have been recognized in this clinic since 1972.

CASE HISTORIES

Case 1
A male Persian kitten, aged 3½ months, was presented for examination because of persistent dribbling of urine from the prepuce. The owner had first noticed this one month before and the condition worsened, finally resulting in haematuria. The perineal skin was inflamed but with the exception of a slight leucocytosis no...
Fig. 1. Case 1. Excretion urogram before surgery. Lateral view 5 min after injection of contrast medium. Both ureters bypass the bladder and terminate directly in the urethra.
other abnormalities were found. Plain radiographs also revealed no abnormalities and hence excretion urography was performed.

The technique of excretion urography in small animals has been described by several authors (Ackerman, 1976; Bartels, 1973; Borthwick & Robbie, 1971; Kneller, 1974; Lord, Scott & Chan, 1974); two reports have been concerned with the cat (Bartels, 1973; Borthwick & Robbie, 1971). In principle the technique is the same in the dog and the cat. A rapid intravenous injection of an adequate dose of contrast medium usually prevents the necessity of high-dose infusion urography (Dure-Smith, 1970) or the use of abdominal compression devices.

In this patient excretion urography was performed by injecting 2 ml of iothalamate (Conray 70, Byk Nederland BV, Zwanenburg, The Netherlands) per kilogram of body weight intravenously. Both kidneys appeared to be relatively large, as is sometimes observed in young cats. The right kidney was asymmetrical with respect to the location of the renal pelvis. There was no dilation of the renal pelves or ureters. Both ureters terminated directly in the urethra at the same level (Fig. 1). Part of the urine from the ureters was expelled via the urethra and part entered the bladder.

Exploratory surgery revealed that both ureters terminated in the urethra, from which they could easily be freed. The ventral wall of the bladder was incised and the two ectopic ureters were implanted in the dorsal wall via oblique submucosal tunnels (Fig. 2). The ureters were fixed to the bladder by four sutures in the mucosa and four in the serosa, using 4-0 Dexon (Dexon, Davis and Geck, Cyanamid International. A Division of the American Cyanamid Company, Wayne, New York). A catheter was inserted into the bladder through the urethra before closure of the bladder and the abdominal wall. Ampicillin was administered subcutaneously for seven days after surgery. After two days, the catheter was removed and the urinary incontinence ceased slowly.

When the cat was re-examined three months after surgery there were no signs of incontinence and micturition was normal. Blood investigation showed no abnormalities and bacteriological examination of the urine was negative. Excretion urography (2 ml iothalamate / kg body weight i.v.) revealed the right kidney to be

![Fig. 2. Implantation of the ureter through the bladder wall via the tunnel technique. (a) Serosa. (b) Muscularis. (c) Mucosa.](image)
of the same size as during the initial examination and it was abnormally small relative to the length of the second lumbar vertebral body (Barret & Kneller 1972). The left kidney was larger than during the initial examination and was within normal limits. There was mild dilation of the proximal part of the right ureter and of both renal pelves (Fig. 3a). Fluoroscopy showed an absence of motility in the proximal part of both ureters. Both ureters terminated in the bladder in the area of its trigone (Fig. 3b).

FIG. 3. Case 1. Excretion urogram three months after surgery (magnification of 70 mm spotfilms). (a) Lateral view directly after injection of contrast medium. There is a mild dilation of the proximal part of the right ureter. (b) Lateral view 30 min after injection of contrast medium. Both ureters enter the bladder at the trigone.
ECTOPIC URETERS IN THE CAT

Case 2

A four-months old female kitten was referred to the clinic because of continuous urinary incontinence since birth. The perineal skin was inflamed as a result of persistent contact with urine. Further physical examination, blood tests and plain radiography of the abdomen revealed no abnormalities.

Excretion urography was performed by injecting 1.5 ml of diatrizoate (Urografin 76%, Schering AG, Berlin/Bergkammen) per kilogram of body weight, without sedation. Unfortunately, the contrast medium was injected subcutaneously rather than intravenously and slow absorption resulted in a low plasma level of the contrast medium and a urogram of low quality. This, together with insufficient preparation of the patient (faecal material was present in the colon), prevented determination of the site of implantation of the right ureter. The left ureter appeared to terminate directly in the urethra. Although kidney density was poor, the size of the kidneys could be evaluated and was within normal limits relative to the length of the second lumbar vertebral body. There was no dilation of the renal pelves or ureters. There were no side effects due to subcutaneous injection of the contrast medium.

A laparotomy was performed and both ureters were found to enter the urethra proximal to the prostate. They were implanted in the bladder, using the same technique as in case 1. A urinary catheter was left in the bladder for two days after surgery and ampicillin was administered daily for one week, during which time the incontinence gradually disappeared.

Eight days after surgery the cat was discharged, but there were still signs of minor urinary incontinence and haematuria. Nitrofurantoine was prescribed for two weeks, following which micturition was normal and the urinary incontinence completely ceased.

Five years after surgery the owner reported that the cat was still in good health and had delivered two normal litters. A third litter had been delivered by Caesarean section. None of the kittens showed any sign of urinary incontinence.

On our request the cat was admitted for re-examination. No physical abnormalities were found and the results of routine blood and urine examination were within normal ranges. Bacteriological examination of the urine was negative. No abnormalities of the kidneys were found by radiography of the abdomen or by excretion urography. Both ureters entered the bladder midway between the apex and the bladder neck, the left ureter entering somewhat ventrally to the right. There was slight dilation of the distal part of the right ureter.

DISCUSSION

Urinary incontinence in the cat is usually due to partial urethral obstruction, obvious neurological lesions of the spinal cord or cystitis. In each of these disorders micturition is normal before the onset of the urinary dribbling. In the two cases presented here, the history of urine incontinence since birth suggested a
congenital defect. Since physical examination revealed no neurological disorders, a defect of innervation of the bladder was considered to be unlikely.

Visualization of the urinary tract by means of excretion urography readily provided the diagnosis of ureteral ectopia, since in both patients the ureters bypassed the bladder completely and entered the proximal urethra. This was surprising, because in almost all dogs with ectopic ureters the authors have examined (Voorhout, Biewenga & Rothuizen, in preparation), the ureters entered the bladder dorsally and continued caudally to terminate in the urethra. In addition, there were no signs of hydroureter, ureterocoele or hydronephrosis, which are frequently associated with ectopic ureters in dogs (Lane, 1973; Lettow et al. 1974; Owen, 1973a,b; Pearson & Gibbs, 1971). The abnormality in the cat reported by Bebco (1977) is similar to that in dogs rather than to that in the two cats described here.

In the male the ectopic orifices always lie within the control of the external sphincter, because of the embryological development of the ureters from the Wolffian duct system (Campbell, 1970; Owen, 1973b). As a result, urinary incontinence occurs less frequently in the male than in the female, although there have been reports of its occurrence in male dogs (Lane, 1973; Lettow et al. 1974; Osbourne & Perman, 1969; Osborne et al. 1975). In the male cat described (case 1), the distal portion of the urethra, including the external sphincter, apparently provided insufficient resistance to urine flow.

In case 1 the dilation of the right renal pelvis and proximal ureter suggested a partial high obstruction of the right ureter after surgery. Neither this, nor the dilation of the left pelvis without accompanying dilation of the left ureter, would appear to have been due to the surgical repositioning of the ureters at the level of the bladder.

In man most of the ureteral anomalies are functionally obstructive because of faulty neuromuscular development of the ureteral wall (Campbell, 1970). The absence of motility in the proximal part of both ureters in case 1 could suggest such a congenital abnormality but, before surgery, ureteral activity was observed. The retardation in growth of the right kidney is unexplained. It is assumed that this was a result of chronic inflammation, which however, could never be diagnosed.

Follow-up radiography in case 2 revealed slight dilation of the right distal ureter. This could have been caused by obstruction of the ureterovesical orifice after surgical intervention, but the obstruction in this case could not have been severe, since there was no caliectasis five years after the operation.

Although surgical intervention resulted in resolution of the clinical problems in these two cases, additional follow-up studies will be required to evaluate the long-term function of the implanted ureters and the corresponding kidneys.

REFERENCES

ECTOPIC URETERS IN THE CAT