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Case Report - Nephrectomy for the Treatment of Ectopic Ureter in a Holstein Heifer Calf

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Abstract

A two week-old Holstein heifer was examined for dribbling of urine and scalding of the perineum since birth. The history and clinical findings were suggestive of an ectopic ureter. Contrast radiography, endoscopic examination of the vagina and urinary bladder, and ultrasonography were supportive of a left ectopic ureter. A definitive diagnosis of a left ectopic ureter and hydronephrosis was made during abdominal exploratory surgery. The left kidney and ureter were removed. The calf recovered without complications or urinary incontinence.

Case History and Clinical Findings

A two week-old Holstein heifer was presented because of urine dribbling and scalding of the hind legs, perineum and tail since birth. The calf was bright, alert, responsive and eating well. External abdominal palpation revealed a small urinary bladder. Urine dribbled intermittently from the vulva, however, the calf was observed voiding urine normally. Fibrinogen was elevated (680 mg/dl; reference range 200-600 mg/dl), while the remaining hemogram, serum chemistry and urinalysis were within normal limits. No neurologic deficits involving the anus or perineum were noted. Routine abdominal radiographs were interpreted to be within normal limits. Based on physical examination, a preliminary diagnosis of ectopic ureter was made.

An intravenous pyelogram was performed to determine the location of the ectopic ureter. Because exploratory surgery was anticipated, the calf was given ceftiofur sodium (1 mg/kg, IV, q 12 hrs) and fluxinin meglumine (1 mg/kg, IV, q 12 hrs) prior to anesthesia. Anesthesia was induced with diazepam (0.1 mg/kg, IV) and ketamine (2.2 mg/kg, IV), and the calf was maintained on isoflurane and oxygen using a semiclosed circle circuit. Intravenous pyelogram was performed by administering 100 ml of diatrizoate sodium[a] through an indwelling jugular catheter. Abnormal radiographic findings included enlarged calyces of the left kidney and a left hydroureter. The hydroureter appeared to bypass the trigone of the bladder and enter the vagina. Additional radiographs revealed persistent opacification of the abnormal kidney. The radiographic findings were suggestive of left hydronephrosis, hydroureter and an ectopic ureter.

Visual inspection of the vagina and vestibule using a speculum and a cystoscope failed to identify the termination of the ureter. However, a constant flow of urine into the vaginal vault continued throughout anesthesia. Since there was no evidence of dysfunction of the opposite kidney and serum creatinine was normal, an exploratory with possible nephrectomy was planned to alleviate the urinary incontinence.

Surgical Management

The calf was placed in dorsal recumbency with the head directed ventrally to aid in retraction of abdominal viscera. A caudoventral midline incision was performed. Balfour retractors were used to improve

[a]Hypaque Sodium, Winthrop Laboratories, New York, NY

exposure of the affected kidney. Surgical exploration revealed that the left kidney was approximately double the size of the right kidney, and the left ureter was approximately 4 mm in diameter, about three times the diameter of the right ureter. The right kidney and ureter appeared normal. The left ureter was occluded first with digital pressure, and then with umbilical tape, which eliminated urine flow from the vagina, confirming that the ectopic ureter was the left one. The left kidney was isolated using moistened laparotomy sponges and blunt dissection was used to remove the overlying peritoneum. Double ligation of the left renal artery and vein was performed using No. 2 polyglactin 910, and the kidney was removed. The ureter was transected as close to the bladder as possible and ligated with No. 0 polyglactin 910. The peritoneum and linea alba were closed using No. 1 polyglactin 910 in a simple interrupted pattern, while the subcutaneous tissues and skin were closed in simple continuous pattern using No. 0 polyglactin and No. 0 polydioxanone sulfate, respectively. The kidney was submitted for histopathology. Gross and microscopic examination of the kidney was compatible with a polycystic, hydronephrotic kidney. Recovery from general anesthesia was uneventful. Postoperatively, the calf urinated normally and no further dribbling of urine from the vulva was noted. The calf was discharged 3 days after surgery. Twelve months later, telephone follow-up reported the calf to be in good overall health, showing no signs of incontinence or urinary tract infection, and reportedly had sustained normal weight gain.

Discussion

Ureteral ectopia is an uncommon congenital anomaly which has been reported in several species.[1,6,15,19,20] Ectopic ureters may be unilateral[1,6,15] or bilateral[15,19] and has been reported in both males[4] and females.[1,6,15,19] Females may be over-represented as they are more likely to be incontinent and easier to recognize.[10] In males, the termination of the ectopic ureter proximal to the external urethral sphincter will result in retrograde filling of the bladder rather than incontinence. The abnormality results from faulty differentiation of the metanephric and mesonephric ducts during embryological development. Normally, the metanephric duct originates from a caudal evagination of the mesonephric duct, and over time the ducts will divide. The metanephric duct migrates cranially to become the ureter, and the mesonephric duct differentiates into the reproductive tract. Failure of the two ducts to separate will lead to formation of an ectopic ureter.[2] In females, an ectopic ureter may terminate in the urethra, vagina, cervix or caudal to the trigone of the bladder,[17] while in males, an ectopic ureter tends to empty into the urethra, vas deferens or seminal vesicles.[5]

Clinical signs of ureteral ectopia depend on the presence of unilateral or bilateral ectopia, termination of the ureter(s), and gender. The most common presenting complaint is urinary incontinence.[1,2,4-6,8,14,15,17,20] Female patients often exhibit urine scalding of the perineum and inside surfaces of the hind limbs while males tend to scald along the prepuce and ventral abdomen. Cases of ureteral ectopia have been reported without a history of incontinence.[13,19] Some affected animals will be incontinent yet exhibit normal micturition behavior.[2] Ruminants often go unnoticed since they are not always observed closely.[7] Persistent urinary tract infections are common in females despite antibiotic treatment since the ureter is opening into the vagina.[1,2,6,7,19]

A polycystic kidney is often found in conjunction with an ectopic ureter.[3,11,16] Hydronephrosis and hydroureter have also been reported in combination with an ectopic ureter,[1,6,13,17,18,22] however, the mechanism responsible for development of these conditions is not known. One possible explanation is ureteral reflux of urine due to the abnormal course of the affected ureter, causing a functional rather than mechanical obstruction. The sophisticated sphincter mechanism of the vesicoureter and urethral valves prevents retrograde flow of urine and the introduction of bacteria into the upper urinary tract. Any factor disrupting this mechanism may cause urine stasis and establishment of infection.[10]

Surgical correction is the definitive therapy for ectopic ureter. Transposition of the ureter into the bladder through a submucosal tunnel[13] and varying ureterovesicular anastomosis techniques[1,4,13,15,18,22] have been attempted. Nephrectomy is also a viable option when the ectopic ureter is unilateral and the unaffected kidney has normal or near normal function.[6,8,21] Postoperative complications include abdominal adhesions,[6,13] intestinal infarction,[15] persistent incontinence,[1,5,22] peritonitis,[13] mucopurulent ureteral discharge,[21] and seroma formation.[21] Nephrectomy was chosen to manage this case because the ectopic ureter was unilateral, and hydroureter and hydronephrosis accompanied the condition. Additionally, the intravenous pyelogram and blood chemistry profile had established that the contralateral kidney was normal or near normal.

Indications for nephrectomy in large animals include unilateral pyelonephritis which is non-responsive to antimicrobial therapy,[9,23,24] renal lithiasis producing clinical abnormalities,[24] ruptured kidney, persistent hematuria of renal origin, and congenital urinary defect (eg. ectopic ureter).[6,8,21] In adult cattle, nephrectomy can be performed in a standing animal through a paralumbar fossa incision.[9,12,24] In neonates, visualization of both kidneys, ureters and the urinary bladder can be gained through a ventral midline celiotomy. Nephrectomy or ureterovesicular procedures can be performed using this approach.[6,8] In some cases, a ventral midline celiotomy

was used in conjunction with a paralumbar approach to ascertain the extent of disease prior to nephrectomy.[8,21,23] In this calf, ventral midline celiotomy was performed. The small size and young age of the calf were a great advantage. Excellent visualization of the caudal abdomen for clear identification of the problem and adequate exposure for surgical removal was obtained.

Previous reports suggest that a fair to guarded prognosis should be given when dealing with cases of ectopic ureters.[2,5,7,15] However, prognosis should be determined on a case by case basis since several factors, such as unilateral verses bilateral, the presence of hydronephrosis or hydroureter, pyelonephritis and postoperative complications will influence the overall success of the case. In this case, nephrectomy provided an excellent surgical option and a good prognosis for resolution of incontinence.

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Abstract

Effects of Dietary Energy and Protein on the Fertility of High Yielding Dairy Cows

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Metabolic profiles have been used in order to provide an overview of the current state of feeding and management in dairy herds in Great Britain. Many cows showed raised beta-hydroxybutyrate, indicating energy deficit, or elevated urea, indicating an imbalance between energy and protein in the rumen. A high proportion of dry cows were too fat, and therefore likely to suffer fatty infiltration of the liver. Within the ranges of milk yields examined, high yielding cows showed no more energy deficit than lower yielding cows.