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# Case Report - Urethrovaginal Fistula in a Llama

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## Abstract

A 4-year-old female llama was admitted to the veterinary teaching hospital with a 12-month history of urinary incontinence and scalding of the perineum and rear limbs. Before the development of the presenting complaint the llama experienced a complicated dystocia. A diagnosis of urine pooling was made following an initial physical exam. Surgical correction was attempted using a urethral extension technique previously described in the cow. However, the llama continued to pool urine post-surgery. After further vaginal examination using endoscopy, a urethrovaginal fistula was diagnosed 10 cm caudal to the cervix, midway between the cervix and the cranial portion of the extended urethra. A second surgery was undertaken to close the fistula. The llama recovered uneventfully, urine pooling ceased and the scalded areas healed. Urethrovaginal fistulas have not been previously documented in llamas.

## Résumé

Une femelle lama de quatre ans a été admise au centre hospitalier universitaire vétérinaire avec des signes d'incontinence urinaire et d'inflammation au niveau périnéal et des membres arrières remontant à 12 mois. Avant le développement de la condition, le lama avait eu une dystocie compliquée. Un diagnostic d'accumulation d'urine a été fait suite à l'examen physique initial. Une correction chirurgicale a été tentée grâce à une technique d'extension urétrale utilisée précédemment chez la vache. Néanmoins, le lama montrait toujours de l'accumulation d'urine suite à la chirurgie. Après un examen vaginal à l'aide de l'endoscopie, une fistule urétrovaginale a été diagnostiquée 10 cm caudalement au col entre celui-ci et la portion crânienne de l'urètre. Une seconde chirurgie a été tentée pour fermer la fistule. Le lama s'est rétabli sans problème, l'accumulation d'urine a cessé et les zones d'inflammation ont guéri. Les fistules urétrovaginales n'avaient pas été décrites précédemment chez les lamas.

## Introduction

Dystocia in lamoids has low prevalence when compared with other species. Only 1.6% of birthings in llamas and alpacas are presented as dystocia, and 25% of those are observed in first birthing.[3] Nevertheless, several postpartum complications have been reported in lamoids, such as uterine and vaginal prolapse, postpartum hemorrhage, and uterine tears among others.[6] To our knowledge urethrovaginal fistula causing urine pooling and infertility following a dystocia has not been documented in domestic llamas. This report describes the potential for a urethrovaginal fistula in llamas to cause urine pooling, that fistula formation may occur following dystocia and that they can be difficult to identify. Additionally, a specific technique used to correct the fistula that has not been previously reported is described.

## History

A 4-year-old, 340 lb (154.5 kg), female llama was admitted to the veterinary teaching hospital for evaluation of urine scalding of the perineum and pelvic limbs of 1-year duration. Hair loss and skin irritation was first seen 3-4 weeks following relief of an elbow lock dystocia and delivery of a dead cria. The referring veterinarian had attempted to resolve the urine scalding by performing a Caslick's[4] procedure, but the condition did not improve.

## Clinical Findings

On physical examination, the perineum and medial aspects of both rear limbs were alopecic, moist and

sloughing superficial layers of the skin. No other abnormalities were noted.

Following caudal epidural anesthesia, the vaginal vault was examined using a sterile 25 cm length fiberoptic sigmoidoscope[a]; a large volume of urine was noted. The cervix was observed to be open and the vaginal floor inflamed. Fluid was detected in the uterus when examined *via* rectal palpation and transrectal ultrasonography. The llama was urine incontinent and unable to produce a strong stream when posturing to urinate. A diagnosis of chronic urovagina and urometria with resulting vaginitis and endometritis, and secondary urine scalding of the perineum and pelvic limbs, was made on the basis of the physical examination.

### Therapeutic/Surgical Management

Initial treatment consisted of cleaning and drying the scalded areas of skin and application of petroleum jelly.

No conformational changes were noted in the cervix, cranial vagina or pelvis, which would predispose to urine pooling. Nevertheless, because of the possibility of damage to the constrictor vestibule muscle during the dystocia, a decision was made to perform a urethral extension surgery in an attempt to eliminate the urine pooling. A urethral extension technique previously described for the cow was used.[11]

Ceftiofur[b] (1 mg/lb IM BID) was administered to the llama for five days following surgery. The Foley catheter placed in the bladder before surgery was deflated and removed 24 hours after surgery, and the llama was observed closely for urination during the next 12 hours. The llama urinated through the urethral extension, but the urinary incontinence was not improved.

Examination of the vagina four days post-operatively revealed a closed cervix and less urine pooling in the cranial vagina. The surgical site appeared to be healing without complications. The uterus was found to be of normal size when examined *per rectum*. The llama's ability to evacuate urine had improved, however, pooling continued to occur, but in less volume. This suggested that urine was escaping from the urethra cranial to the extended orifice, or that the extension was not effective. An endoscopic[c] evaluation of the urethra was performed simultaneously with vaginoscopy, which identified a urethrovaginal fistula approximately 4 inches (in) (10 cm) caudal to the cervix and 4 in (10 cm) anterior to the cranial portion of the extended urethra. The fistula was not identifiable with vaginal examination alone. A diagnosis of urethrovaginal fistula was confirmed by placing a Foley catheter in the urethral opening and infusing dilute methylene blue solution. The dye was observed through a vaginal speculum as it flowed into the vagina through the opening. The fistula was approximately 0.4 in (1 cm) in length with smooth edges, suggesting long duration.

A surgical approach for closing the fistula was attempted. Feed and hay were withheld for 48 hours, and water for 24 hours. Anesthesia was induced with guaifenesin and thiopental *via* intravenous injection, and maintained with Halothane through standard endotracheal intubation. The llama was placed in sternal recumbency with the tail wrapped and tied dorsally. Feces were removed from the rectum, and a tampon made from a 3-inch stockinet filled with cotton gauze was placed in the rectum to prevent fecal passage. The perineal area was prepared for aseptic surgery. One Foley catheter was placed in the urethra *via* the vestibular urethral opening, and a second one was placed through the fistula in the vagina to aid in detecting its location.

An incision was made through the dorsal commissure of the vulva extending into the perineal body, but not involving the rectal mucosa. The muscles of the perineal body were dissected cranially approximately 4 in (10 cm) to improve visualization. The vulvar lips were retracted with stay-sutures. A Gelpi self-retaining retractor was inserted into the vaginal mucosa and retracted caudally. Two stay-sutures were placed cranial and caudal to the opening of the fistula in the vaginal floor in order to stabilize the area. The vaginal Foley catheter was removed from the fistula. The urethral mucosa was identified at the fistula opening and the edges undermined to separate vaginal and urethral surfaces. The urethral submucosa was then sutured with 3-0 Polydioxanone (PDS) using a simple continuous pattern (Figure 1). Two additional interrupted sutures were placed at the cranial and caudal aspects of the suture line. The vaginal tissue was left to heal as an open wound. The perineal body was closed with 3-0 Polyglactin 910 (vicryl) in a simple continuous suture pattern. The vaginal and vestibular mucosa were apposed with 3-0 Polyglactin 910 (vicryl) in a continuous horizontal mattress pattern. A "Caslick's"[4] procedure was performed to close the dorsal vulvar opening, using #2 Polyamide in a continuous forward interlocking pattern. Ceftiofur was administered post-operatively (1 mg/lb IM BID) for five days. The Foley catheter was left in the urethra for 48 hours and then removed. The llama was observed closely for the following 12 hours to assess urination.

The llama developed cystitis, confirmed by urinalysis, two days post-surgery. Procaine penicillin G[d] (10,000 units/lb SQ SID) was added to the treatment regimen for five days, but was not effective in eliminating the cystitis. Antibiotic therapy was changed to ampicillin trihydrate[e] (5 mg/lb IM SID) for five days, and improvement was noted as determined by serial urinalyses. Daily postoperative evaluation of the scalded areas of skin initially showed some residual redness and superficial de-

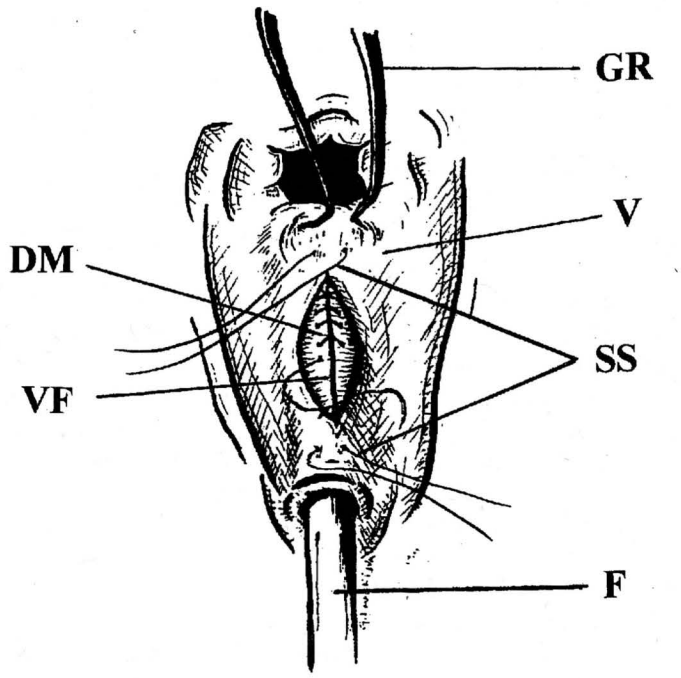


**Figure 1.** View of the vagina (V), and urethrovaginal fistula (VF). Foley catheter in the urethra (F). Gelpi self-retaining retractors (GR). Stay sutures (SS). Placement of simple continuous pattern in the debrided mucosa (DM). (Drawing courtesy of Gregory Emmert DVM.)

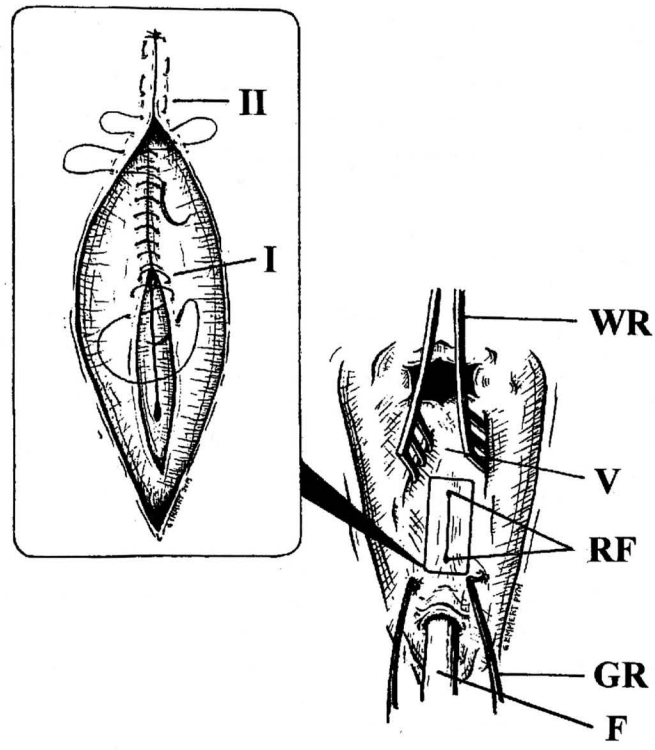


**Figure 2.** View of the vagina (V). Small opening of repaired fistula (RF). Weitlaner self-retaining retractors (WR). Gelpi self-retaining retractors (GR). Foley catheter (F). Placement of simple continuous pattern in the submucosa that obliterate the fistula (I). Placement of continuous horizontal mattress pattern in the vaginal mucosa (II). (Drawing courtesy of Gregory Emmert DVM.)

bris, but the areas remained dry. Continued improvement in the condition of these areas was evident over time. Examination of the vagina five days post-surgery revealed a small amount of urine (5 ml) in the cranial vagina. At that time, a Foley catheter (18F) was placed just inside the urethral opening and the bladder was filled with a dilute, sterile methylene blue solution. This confirmed the presence of two small openings at the cranial and caudal aspects of the repaired fistula.

Six weeks was allowed for healing before a second attempt to repair the fistula was performed. Anesthesia and surgical preparation were performed as previously described, except the perineal area was not incised during the second procedure. A Foley catheter (18F) was placed just inside the urethral opening, and the bladder and urethra were filled with methylene blue solution to demonstrate the areas of urine leakage. The vagina was retracted using Weitlaner self-retaining retractors (Figure 2), and maintained with two stay-sutures placed in the vaginal floor. The vagina was stabilized using a Gelpi self-retaining retractor. Following removal of the Foley catheter, the vaginal mucosa and submucosa were dissected for approximately 0.4 in (1 cm) around the two openings, thus creating a shelf between the vaginal mucosa and submucosa. The submucosa was apposed using 2-0 Polyglactin 910 (vicryl) in a simple continuous pattern. This suture line was oversewn with another simple continuous suture pattern. The vaginal mucosa was apposed using the same absorbable suture material in a continuous horizontal mattress pattern (Figure 2). Post-operatively, the llama was administered ceftiofur (1 mg/lb BID) for five days, and checked daily for urine dribbling or scald. Vaginal examination 10 and 20 days after surgery showed no signs of urine pooling in the caudal vagina. The cervix was open but neither palpation nor ultrasonography *per rectum* identified fluid in the uterus.

The llama was discharged from the hospital 30 days after surgery. The owner was instructed not to allow mating, to monitor the scalded areas and to return in 45 days for reexamination. At discharge the llama had no urine pooling and the scalded areas of the perineum and pelvic limbs had healed completely.

To further assess urethral mucosal integrity, contrast urethrography was performed 10 weeks following the last surgery. A Foley catheter (18F) was placed inside of the urethra and the bulb inflated with air. Following induction and maintenance of general anesthesia as described previously, the llama was placed in both right lateral and dorsal recumbency, and survey radio-

graphs were taken of the pelvis. The findings were interpreted as normal. A retrograde urethrogram study was performed by rapid hand injection of diatrizoate meglumine and diatrizoate sodium[f] (30 ml, 370 mg organically bound iodine/ml) contrast agent into the catheter with the animal in the left ventrolateral-20°-right dorsolateral oblique position. The resulting images showed dilatation of the distal portion of the urethra where the bulb of the Foley catheter was inflated, with the urethral diameter narrowing to 4 mm just cranial to the tip of the catheter. The urethra narrowed further to 3 mm just caudal to the neck of the bladder where the contrast entered the bladder lumen. The urinary bladder was incompletely distended with contrast but was otherwise unremarkable. A second injection of an additional 40 ml of the same contrast agent was made with the patient in right lateral recumbency and the catheter position unchanged. This revealed a mild to moderate degree of mucosal irregularity along the dorsal margin of the urethra with multiple, small, poorly defined, triangular-shaped, contrast-filled lesions extending into the dorsal wall of the urethra. Both views showed a circumferential mural filling defect at the junction of the urethra with the neck of the bladder, resulting in a concave appearance which slightly indented the bladder neck. The urethral mucosa was unremarkable from the catheter tip level distad. Luminal diameter in the area of the mural defects was 3 mm. These findings were consistent with chronic inflammation of the urethral wall (urethritis) with granulation tissue and/or fibrosis probably accounting for the larger circumferential mural filling defect around the bladder neck. However, normal urethral mucosal integrity with contrast urethrography has not been reported in the llama, limiting our decision on the finding.

Six months after the contrast urethrography was performed, the llama was exposed and hand mated. Pregnancy was confirmed four months later by abdominal ultrasonography.

## Discussion

Urine pooling in the cranial vagina is transient in some cows immediately postpartum or during estrus.[11] The constrictor vestibule muscle causes a U-shaped ridge to form cranial to the urethral orifice during normal urination in conjunction with the caudoventral tipping of the pelvis that occurs when the cow positions herself to urinate, promoting caudal flow of urine.[7] Any acquired anatomic abnormalities due to dystocia that cause poor vestibular muscle tone, or cranioventral tipping of the vulva during urination, can lead to urine gravitation into the cranial vagina and result in urine pooling. In mares, urine pooling is proportional to the degree of slope of the vaginal floor.[10] However, in both species the problem can often be resolved with urethral extension surgery. This is a more complex procedure in cattle than in horses because the urethral diverticulum and the position of the urethral orifice limit the extent of dissection that can be achieved in the vaginal floor cranial to the urethral orifice.[8] In a study of urinary tract fistulas at a variety of anatomical locations involving 98 women, 94.9% of the fistulas occurred as a result of obstructed labor.[1] Fistulas located between the urethra and the vagina were reported in 13 of 86 women suffering from urovaginal fistulas.[2] Fistula formation as a common complication following surgical redirection of urine flow out the vulva using the vestibuloplastic or urethroplasty procedures in mares and cows has been reported.[9] However, this type of fistula is found at the cranial aspect of the suture line just dorsal to the urethral opening, and not midway between the cervix and the urethral opening.

Neither urethral extension to correct urine pooling nor urethrovaginal fistula due to dystocia have been documented in llamas. Although repair of fistulas resulting from obstetric trauma in women remains a major challenge to surgeons worldwide, the preferred route for the closure of vesicovaginal or urinary tract fistulas is the vaginal route.[1,12] The uniqueness to each case of female urethral injury has determined the creation of individualized techniques to fit each set of special circumstances.[5] Our surgical approach and technique was tailored around the character of the injury and the anatomy of the female genitalia in this particular llama, and no specific previously described technique was used to repair this condition.

## Conclusions

Urovagina in this llama was believed to have resulted from injury to the pelvic urethra during efforts to relieve a dystocia. Other causes that could create this urethrovaginal fistula included an incision made through the vagina during the initial urethral extension, a complication of the urethroplastic surgery due to excessive swelling of the surgical site creating a rupture of the urethra through the vagina, or a fistula created during urethral catheterization. However, during the initial surgery, the animal was under general anesthesia and the vaginal mucosa was not exposed as far as the location of the fistula. Second, surgical complications of urethral extension that can develop into a fistula are normally located at the cranial aspect of the suture line just dorsal to the urethral opening.[9] Third, the rubber Foley catheter used in the initial surgery (urethral extension) for catheterization of the bladder was placed without any stiletto or sharp instrument that could perforate the urethra. In addition, the fact that the edges of the fistula were smooth, indicating a more

chronic problem that allowed time for healing, and that the urine scalding resolved once the cranial fistula was closed, all highly suggest that the fistula was trauma induced at the time of the dystocia one year earlier. It should be noted that the initial vaginal examination *via* speculum alone failed to identify the cranial fistula, and simultaneous examination utilizing dye infusion through a urethral catheter and vaginoscopy should be considered to rule out urethral-vaginal fistulas in cases of urine pooling. The surgical approach to correct urethral-vaginal fistulas is somewhat individually case dependent. Successful repair of urethral-vaginal fistulas is possible provided the surgeon is able to create adequate access to the surgical site.

### Footnotes

[a]Fiber Optic Sigmoidscope (15mm x 25cm), Welch Allyn, Skaneateles Falls, NY.
[b]Naxcel®, Pharmacia Animal Health, Kalamazoo, MI.
[c] Fiber Optic Endoscope, W.F. Schmidt Co (6mm x 145cm), Machida. Model RA-150A3 (light source).
[d]Pen-Aqueous, Dealer Distribution of America, Porterville, CA.
[e]Polyflex®, Fort Dodge Animal Health, Fort Dodge, IA.
[f]Reno-Cal 76™ Injection USP, Bracco Diagnostics, Inc, New Brunswick, NJ.

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# Abstract

## Abattoir Survey of Dental Defects in Cull Cows

B. Ingham

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The teeth in severed heads of 501 cull cows, all over 30 months of age, were examined at an abattoir in the north of England in 1997/98; 80 percent of them were Friesians or Holsteins. Seventy-three animals (14.6 percent) had one or more missing incisors, most of which were acquired losses. Rotation and overlapping of rostral teeth were also common, as was attrition. Congenitally absent first lower premolars, other missing teeth, large and often multiple interdental spaces, and a few cases of macrodontia, cavitation, multiple defects and fractures were observed in the cheek tooth arcades. There were some unusual patterns of premolar and molar attrition, often attributable to malocclusion, one result of which was the formation of a hook at the posterior extremity of the third maxillary molar.