

### Congenital vulvar deformity in 6 alpacas

Pamela A. Wilkins, DVM, PhD, DACVIM, DACVECC; Louise L. Southwood, BVSc, PhD, DACVS, DACVECC; Daniela Bedenice, DVM, DACVIM, DACVECC

#### Case Description
- 6 female alpacas, ranging in age from < 1 day to > 2 years, were examined because of primary owner complaints related to urogenital malformation.

#### Clinical Findings
- In all instances, the vulva was totally to subtotally imperforate. One neonate had failure of passive transfer of immunity and mild azotemia at the time of initial examination. No additional urogenital malformations were detected in any of the alpacas.

#### Treatment and Outcome
- Vulvoplasty performed via local anesthesia was successful in all alpacas. The neonate with failure of passive transfer received a plasma transfusion. Postsurgical wound management was limited to topical applied medications.

#### Clinical Relevance
- Congenital vulvar deformity in alpacas may result in interference with urine outflow. Neonates with a completely imperforate vulva may be brought to veterinarians for examination on an emergency basis. Less severely affected alpacas may be examined later in life with owner complaints ranging from stranguria or dysuria to urogenital malformation. No other primary abnormalities of the urogenital tract in alpacas have been reported, to the authors’ knowledge. Vulvoplasty, performed with local anesthesia, resolves obstructed urine flow. Because it is possible that this condition is heritable, affected alpacas, and possibly their sires and dams, should not be used for breeding.

#### Results of ultrasonographic evaluation
- Results of ultrasonographic examination of the fluid-filled structure and urogenital tract suggested that the absence of a vulvar opening was the primary abnormality. Fluid, thought to be urine, was detected in the uterine lumen. The diagnosis was imperforate vulva or fusion of the vulvar labia with secondary mild urethra.

- The cria was positioned in ventral recumbency and the vulvar skin was aseptically prepared with chlorhexidine scrub and sterile water. Local anesthesia was provided via SC injection of a small (< 2 mL) volume of 2% lidocaine solution. A temporary stoma was created in the vulva by stab incision with a No. 11 scalpel blade. After the procedure, the cria was observed to urinate. On the following day, a permanent stoma was created with the cria positioned, aseptically prepared, and anesthetized locally, similar to the first procedure. The temporary stoma was elongated on midline with a No. 11 scalpel blade, and with mosquito hemostats and digital palpation used to guide the incision, the opening was extended dorsally and ventrally. Care was taken to incise only vulvar tissue. The permanent stoma was created by apposing vestibular mucosa to vulvar skin with 4-0 synthetic absorbable suture material in an interrupted pattern to prevent adhesion formation between, and reposition of, the vulvar lips (Figure 2). Additional treatments included topical wound treatment with a triple-antimicrobial and corticosteroid ointment,

- *Results of ultrasonographic evaluation of the fluid-filled structure and urogenital tract suggested that the absence of a vulvar opening was the primary abnormality. Fluid, thought to be urine, was detected in the uterine lumen. The diagnosis was imperforate vulva or fusion of the vulvar labia with secondary mild urethra. The cria was positioned in ventral recumbency and the vulvar skin was aseptically prepared with chlorhexidine scrub and sterile water. Local anesthesia was provided via SC injection of a small (< 2 mL) volume of 2% lidocaine solution. A temporary stoma was created in the vulva by stab incision with a No. 11 scalpel blade. After the procedure, the cria was observed to urinate. On the following day, a permanent stoma was created with the cria positioned, aseptically prepared, and anesthetized locally, similar to the first procedure. The temporary stoma was elongated on midline with a No. 11 scalpel blade, and with mosquito hemostats and digital palpation used to guide the incision, the opening was extended dorsally and ventrally. Care was taken to incise only vulvar tissue. The permanent stoma was created by apposing vestibular mucosa to vulvar skin with 4-0 synthetic absorbable suture material in an interrupted pattern to prevent adhesion formation between, and reposition of, the vulvar lips (Figure 2). Additional treatments included topical wound treatment with a triple-antimicrobial and corticosteroid ointment, support with IV administered fluids, and administration of cefotulur sodium (10 mg/kg [4.5 mg/lb], IV, q 6 h). The cria continued to urinate normally and was discharged to the owner 3 days after admission for continued wound management at home. The cria did well clinically, and no additional genitourinary problems were reported.

- A 2-day-old cria was examined at the Cummings School of Veterinary Medicine at Tufts University because of stranguria (case 2). Parturition had reportedly been without complications. At the time of initial examination, the cria was bright and alert, mildly febrile (rectal temperature, 39.2°C [102.6°F]), tachycardic (heart rate, 170 beats/min), and tachypneic (respiratory rate, 48 breaths/min). Examination revealed a distended, subtotally imperforate vulva. A small (< 1 mm) opening, through which the cria had been urinating, was observed in a ventral position on the vulvar lips (Figure 1). Except for high serum creatinine kinase activity (1,718 U/L), no hematologic or plasma biochemical abnormalities were identified. Plasma IgG concentration was adequate. The vulvar skin was anesthetized with local infiltration of 2% lidocaine solution and surgically opened to restore full patency of the urinary tract. The cria recovered without complications.*
A 4-week-old female cria, was examined with a history of persistent watery diarrhea that had been observed for the previous 10 days (case 3). On physical examination, the cria was in good body condition but was mildly tachypneic (respiratory rate, 40 breaths/min). Examination of the urogenital tract revealed congenital fusion of the vulvar labia, with only a small opening (<1 mm) in the lower third of the vulva through which the cria voided a thin stream of urine (Figure 1). No hematologic or plasma biochemical abnormalities were identified. A contrast vaginourethrocystogram of the urogenital tract revealed no evidence of other urinary malformations. Ultrasonographic examination of the urogenital tract revealed evidence of uterine atresia. During hospitalization, the cria passed a moderate amount of pasty diarrhea. Because of this finding, vulvoplasty was postponed so as to limit wound contamination. Ten days after the initial examination, the diarrhea had resolved and the cria was readmitted for a vulvoplasty procedure. A full stream of urine was observed after the procedure, and the cria had an uncomplicated recovery.

A 1-day-old female full sibling to the cria of case 3 was admitted for correction of an imperforate vulva (case 4). The owner had permitted a repeat breeding between the same sire and dam, despite evidence of a congenital vulvar anomaly in case 3. Similar to findings with the cria of case 3, the sibling cria did not have any physical abnormalities other than mild tachypnea (42 breaths/min) and congenital vulvar labial fusion, which led to marked vulvar distension and impaired urination. In this cria, plasma creatinine concentration was high (3.5 mg/dL), and the cria had partial failure of passive transfer (IgG concentration, 125 mg/dL; reference concentration, >1,000 mg/dL). The partial failure of passive transfer was treated with IV administration of alpaca plasma. Vulvoplasty was performed with no complications via local anesthesia, and the cria recovered fully.

Cases 5 and 6 involved alpacas from the same farm as cria 1; the 3 alpacas were reportedly unrelated. The alpacas were examined at the New Bolton Center on the same date with identical complaints of vulvar deformity, stranguria, and perineal staining. In both cases, vulvar labial fusion was apparent but there was sufficient ventral opening to allow for urination (Figure 1). One alpaca was 1 year of age, and the other was 2 years of age. Vulvoplasty was completed without complications on an outpatient basis.

Discussion

To the authors’ knowledge, congenital labial fusion has not been reported in alpacas or other South American camelids. Atresia vulvae was reported in 2 camels in 1997, and an incompletely developed vulva has been described in a Friesland heifer. Additionally, posterior vulvar labial fusion was reported as a familial trait in a human female in which the family history was remarkable for a similar congenital defect in 2 aunts and their daughters, suggesting an autosomal dominant trait with incomplete penetrance. Vulvar fusion with a suspected autosomal recessive mode of inheritance has also been reported in a colony of common marmosets. In these marmosets, as was reported in the affected humans and observed in the camelids of...
this report, only the vulva was affected; there was no
evidence of defects in any other portion of the genitourinary tract, such as clitoral hypertrophy, which has
been associated with certain adrenogenital syndromes and with exogenous androgen therapy of the dam, sex
reversal, or freemartinism and chimerism.\textsuperscript{5,8} Recessive inheritance implies that both parents must carry the
undesirable genetic trait, although neither the dam nor
the sire will necessarily express the defect phenotypi-
cally. If the inheritance pattern for this trait in camelids is
similar to that in marmosets, further breeding of
either parent or the affected cria may perpetuate spread
of the undesirable trait, although the gene may not be
expressed in all offspring.

Two of the alpacas of this report had urometra, like-
early secondary to occlusion of urinary tract outflow
associated with the vulvar deformity and resultant backflow
of urine through the cervix into the uterus. Dense and
nearly complete labial fusion with severe hydroureter-
nephrosis that resolved after incision of the adherent
labia has been reported in a single human infant.\textsuperscript{9} In
another report,\textsuperscript{10} stranguria and urethral duplication in
an intersex llama cria was described. Distension of the
genitourinary tract with urine may be seen in alpacas
with vulvar fusion and is likely dependent on the
degree of deformity; imperforate vulvar deformities
may be encountered by veterinarians as a neonatal
emergency, as occurred in case 1, whereas less severely
affected animals may be examined for other reasons,
ranging from suspected diarrhea with stranguria to
deficiency in females reaching breeding age.

The evidence suggests that this congenital defor-
mity may have a heritable component in alpacas, on
the basis of appearance of the defect in 2 full siblings
produced from sequential breedings in separate years.

It is possible that environmental or infectious causes
play a role, but this seems less likely. For all alpacas of
this report, a recommendation was made to owners not
to use the affected animals as breeding stock, and in
case 3, a specific recommendation was made to not
repeat the breeding. Because the reproductive tract
appears to be normal in affected alpacas, corrective
surgery should be performed to allow for appropriate
urine outflow, but breeding of affected females, and
potentially their dams and sires, should be discouraged.

\textit{References}

1. Ramadan RO. Atresia vulvi in camels—case reports. \textit{J Camel
     Pract Res} 1997;4:87–88
2. Oettle EE, Coubrough RI. A pregnant heifer with a congen-
3. Klein VR, Willman SP, Carr BR. Familial posterior labial
     caused fused labia in the common marmoset (\textit{Callithrix jaccus}). \textit{J Med
     \textit{Sry}-negative XX sex reversal in a llama with multiple congenital anom-
7. Hinrichs K, Buoen LC, Ruth GR. XX/XY chimerism and
     freemartinism in a female llama co-twin to a male. \textit{J Am Vet Med Assoc}
8. Wilker CE, Meyers-Wallen VN, Schlafer DH, et al. XX sex
9. Norbeck JC, Ritchey MR, Bloom DA. Labial fusion causing
10. Lopez MJ, Markel MD, Dubielzig R. Urinary obstruction in

\textit{a.} Panalog, Fort Dodge Laboratories, Fort Dodge, Iowa.
\textit{b.} Naxcel, Pharmacia and Upjohn Co, Kalamazoo, Mich.