An 8-year-old 635-kg (1,397-lb) Hanoverian gelding was referred for evaluation of urinary tract problems. The horse had been dribbling urine for approximately 4 years. One year prior to referral, the referring veterinarian had detected an enlarged urinary bladder. Endoscopic evaluation of the urethra had revealed 2 urethral webs approximately 10 and 65 cm proximal to the external urethral opening. The referring veterinarian was able to pass an endoscope into the urinary bladder, at which time a large amount of sabulous material was evident within the distended bladder. Treatment consisted of administration of broad-spectrum antibiotics (penicillin and gentamicin, followed by trimethoprim-sulfonamide), flunixin meglumine, and betahaneol. In addition, the bladder was lavaged on multiple occasions followed by infusions of nitrofurazone, dexamethasone, gentamicin, and atacylecaine. The horse had been vaccinated 30 days prior to referral against eastern and western equine encephalitis, tetanus, rabies, equine influenza, and equine rhinopneumonitis. In addition, the horse was dewormed with ivermectin on a regular basis.

On physical examination at the veterinary teaching hospital, the horse's rectal temperature (38.1°C [100.6°F]), heart rate (40 beats/min), and respiratory rate (12 breaths/min) were normal. The horse dribbled approximately 30 ml of urine during the examination. During per rectum palpation of the abdomen, the bladder was distended. Neurologic examination revealed mild proprioceptive deficits of the left hind limb, mild right gluteal muscle atrophy, moderate left gluteal muscle atrophy, and atrophy of the left sacrocaudalis dorsalis muscle at the origin of the tail. The horse was sedated with xylazine hydrochloride (0.01 mg/kg [4.5 mg/lb], IV), flunixin meglumine (1.1 mg/kg [0.5 mg/lb], IV), acepromazine (0.02 mg/kg [0.01 mg/lb], IV), and butorphanol (0.02 mg/kg, IV). The urethra was topically anesthetized by infusing 2% lidocaine through the endoscope. A bare-fiber noncontact transendoscopic technique, using a neodymium:yttrium-aluminum-garnet (Nd:YAG) laser, was used to ablate the urethral obstruction. The laser was set to deliver short (2- to 3-second duration) bursts of power (40 W) to avoid excessive injury to surrounding urethral mucosa; a total of 1,200 J was used. Following the laser procedure, the endoscope was advanced into the bladder. The urine appeared mucoid, and the mucosa was markedly hemorrhagic. Thick mucus, urine, and small amounts of blood were subsequently evacuated from the bladder through a urethral catheter.

Initial treatment included administration of enrofloxacin (4 mg/kg [1.8 mg/lb], PO, q 12 h) and flunixin meglumine (1.1 mg/kg [0.5 mg/lb], IV, q 12 h). Enrofloxacin was chosen, because other broad-spectrum antimicrobials available for use in horses had been administered extensively by the referring veterinarian. Administration of enrofloxacin was discontinued 2 days after admission, because organisms cultured from the urine were found to be susceptible to trimethoprim-sulfonamide, and treatment with trimethoprim-sulfamethoxazole (30 mg/kg [14 mg/lb], PO, q 12 h) was instituted. Histologic evaluation of the urethral biopsy specimen revealed supplicative inflammation with a caseous core; there was no evidence of neoplasia or hyperplasia. Cerebrospinal fluid obtained via the lumbosacral space was acellular with a slightly high IgG concentration (16.6 mg/dl; reference range, 3 to 10 mg/dl), but albumin concentration (42.2 mg/dl; reference range, 15 to 70 mg/dl) was normal. Results of western blot analysis of CSF for antibodies to Sarcocystis neurona were weakly positive. However, the albumin quotient of 2.8 (reference range, 0 to 2.2) suggested that the CSF was contaminated with blood. The owner elected not to treat the horse specifically for
S. neurona infection because of the low positive predictive value of a weakly positive western blot result in combination with an abnormal albumin quotient.1

Endoscopy was repeated 2, 5, 7, and 9 days after admission, revealing progressive resolution of urethral ulceration. By day 9, mucosa at the site of laser surgery had minimal evidence of trauma (Fig 1). In addition, the horse began to posture to urinate, producing a stream of urine. However, it was not able to fully evacuate the urinary bladder. The horse was discharged 10 days after admission with instructions to continue administration of trimethoprim-sulfamethoxazole at the same dosage for an additional 7 days.

Three weeks after the horse was discharged from the veterinary teaching hospital, the referring veterinarian reported that the sites of previous urethral webs were grossly healed and that there was no endoscopic evidence of a urethral stricture. However, endoscopy caused mild hemorrhage at the laser surgery site. The bladder also appeared endoscopically normal, and results of a urinalysis were normal. Although the horse continued to dribble urine, it was able to voluntarily posture and urinate. Six months after discharge, the horse was reevaluated at the veterinary teaching hospital because the referring veterinarian had difficulty passing an endoscope into the bladder. During urethroscopy at the veterinary teaching hospital, an area of scar tissue and hemorrhagic urethral mucosa was evident 65 cm proximal to the external urethral opening. However, there was no observable web of tissue preventing passage of the endoscope. A small amount of mucoid urine was evident in the bladder, and the bladder mucosa appeared grossly normal. The horse was discharged without further treatment, and the referring veterinarian agreed to reexamine the horse monthly to ensure that a urethral catheter could be readily passed into the bladder.

Endoscopic views of the urethra of a horse before (left) and 9 days after (right) laser ablation of a urethral web causing urinary outflow obstruction. (Figure 1)

Conditions of the equine urogenital tract that are amenable to treatment with surgical lasers have not been extensively documented, although laser ablation of uterine cysts2 and laser lithotripsy for treatment of urolithiasis3 have been reported. The Nd:YAG laser is ideally suited to treatment of lesions that are accessible with an endoscope, because at a wavelength of 1,060 nm, Nd:YAG laser energy is readily transmitted by flexible glass fibers. There are 2 general types of Nd:YAG laser fibers: noncontact fibers used for relatively high-power applications (up to 110 W) and contact fibers used for relatively low-power applications (up to 20 W). Noncontact techniques are most suitable for lesions for which tissue ablation is the primary goal. This is because noncontact application of laser energy results in increased absorption and scattering of energy within the tissue. This, in turn, results in latent thermal necrosis, so that tissue that was not visibly ablated or damaged during the laser procedure subsequently undergoes necrosis. For ablation of the obstructive urethral web in the horse described in the present report, we choose a power setting of 40 W to take advantage of the ablating properties of the noncontact technique but minimize latent thermal necrosis to the urethral mucosa.

The cause of this horse's urethral obstruction could not be determined. The history and physical examination findings suggested that a neurologic cause of bladder atony such as cauda equina syndrome, equine protozoal myeloencephalitis (EPM), or herpes myeloencephalitis may have played a role in triggering urinary tract dysfunction. Neurologic impairment of bladder emptying could have, in turn, resulted in secondary urinary tract infection, which may have led to urinary tract obstruction.
urethral ulceration\textsuperscript{1} and formation of scar tissue. Of the possible neurologic causes of bladder atony, EPM was considered the most likely because of the asymmetric lower motor neuron signs (muscle atrophy) and proprioceptive deficits of the hind limbs.\textsuperscript{6} However, evidence for EPM was inconclusive, because the weakly positive results of the western blot assay for \textit{S. neurona} antibody may have resulted from blood contamination.\textsuperscript{1} Regardless of the cause of the neurologic disorder, the signs had been stable during the past several years, suggesting that the disease was chronic and inactive and, thus, less likely to respond to treatment, even if it was EPM.\textsuperscript{7}

The most common cause of urinary outflow obstruction in horses is urolithiasis.\textsuperscript{8,9} Although uroliths are most commonly located in the bladder, urethral calculi have been described.\textsuperscript{10,11} Urethral calculi can be removed via urethrotomy\textsuperscript{11,12} or by means of transurethral laser lithotripsy.\textsuperscript{3} Other conditions that have the potential to cause urethral obstruction include neoplasia and habronemiasis, although these conditions typically affect the distal portion of the penis rather than more proximal parts of the urethra. Although resection of the distal part of the penis is feasible,\textsuperscript{13-15} the proximal location of the obstructive urethral web in the horse described in the present report would have made use of traditional surgical methods problematic.

\textbf{References}


