

ULTRASONOGRAPHIC FEATURES OF GRASS AWNS IN THE URINARY BLADDER

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Grass awns are a common cause of foreign body disease in animals, but little is known about their presence in the lower urinary tract. The ultrasonographic features of grass awns *in vivo* and *in vitro* have been described in detail. The purpose of this report is to describe the clinical and sonographic features of grass awns in the urinary bladder of dogs and cats. Three male Yorkshire terriers (one of which was examined twice) and one female domestic short-haired cat were evaluated for signs of lower urinary tract disease, and an intravesicular grass awn was suspected based on ultrasound examination. The grass awn appeared ultrasonographically as a bladder stone ($n=1$) or a linear hyperechoic structure ($n=4$) with or without acoustic shadowing that was easy to identify due to contrast with surrounding urine. The presence of a grass awn within the urinary bladder was confirmed during exploratory surgery. In all patients, the route of entry of the grass awn was thought to have been retrograde migration from the urethral opening. The ultrasonographic appearance of grass awns in the bladder is consistent with that in other tissues. © 2010 *Veterinary Radiology & Ultrasound*, Vol. 51, No. 4, 2010, pp 462–465.

Key words: foreign bodies, grass awn, lower urinary tract.

Introduction

INTRAVESICULAR FOREIGN BODIES are more common in people^{1,2} than in animals.^{3–7} Grass awns are common causes of foreign body disease in animals.^{8–20} Grass awn foreign bodies were described in 1935 as a cause of mandibular abscess formation in sheep.¹⁴

In the western United States, *Hordeum* species predominate,^{8,10} while *Stipa* and *Setaria* species predominate in the southern United States.^{8,10,11} Grass awns are also found in Europe and Australia, and foreign body reactions have been reported there as well.^{8,10–12,17}

The shape of the grass awn, having a sharp point on one side and barbs on the other, allows tissue penetration but not backward movement, resulting in unidirectional migration.^{9,10,12,16,17,19} Dogs are afflicted more commonly than cats, with hunting breeds and other long-haired, outdoor animals being most commonly affected.^{8,10,11,19} Grass awns are most frequently found in the external ear canal, subcutaneous tissue, conjunctiva, and nasal and oral cavities, but can also reach the thoracic or abdominal cavity or

sublumbar musculature by penetrating the body wall, ingestion, or inhalation and subsequent migration.^{8–10,19}

Ultrasound imaging is useful for the diagnosis of grass awn disease in dogs and cats. Intravesicular grass awn foreign bodies are rare in animals, but some information is available⁸ and they could contribute to recurrent lower urinary tract signs. The object of this report is to describe the ultrasonographic appearance of intravesicular grass awns.

Materials and Methods

We identified animals having surgical confirmation of a grass awn foreign body in the urinary bladder and preoperative sonographic images. Ultrasound examinations had been performed using an ultrasound machine* with a curvilinear 5–8 MHz blended frequency transducer. Information regarding age, body weight, and breed was obtained from each medical record. Results of physical examination, serum biochemistry panel, CBC, and urinalysis were recorded. If available, thoracic and abdominal radiographs were reviewed.

Results

Three dogs and one cat met the inclusion criteria and are described individually.

Dog 1

A 1.5-year-old male Yorkshire terrier weighing 2.9 kg (6.4 lb) had a 2-day history of lethargy, inappetence, and a

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Received November 10, 2009; accepted for publication February 22, 2010.

doi: 10.1111/j.1740-8261.2010.01688.x

*ATL 3000/5000, Philips Medical Imaging systems, Bothell, WA.

resolving cough. There was pelvic limb paraparesis and a large painful right testicle. The caudal abdomen was painful on palpation. There was mild leukocytosis with a regenerative left shift and monocytosis. A diffuse loss of serosal detail was noted on abdominal radiography. Sonographically, a small volume of cellular-appearing echogenic free abdominal fluid was noted. A hyperechoic linear foreign structure with mild acoustic shadowing was seen in the urinary bladder (Fig. 1). An ill-defined amorphous fluid pocket was present dorsal to the urinary bladder, between the iliac bifurcation. The right epididymis was enlarged. A tentative diagnosis of bladder foreign body with regional sepsis and right epididymitis was made. The right testicle, with an enlarged epididymis, was removed. Two grass awns were removed from the urinary bladder. A fluid pocket near the bladder was felt to coincide with the amorphous structure seen with ultrasound. *Staphelococcus intermedius* was isolated.

Dog 2

A neutered male Yorkshire terrier of unknown age weighing 3.2 kg (7.04 lb) had a history of hematuria, stranguria, and pollakiuria. The dog had undergone a scrotal urethrostomy 6 months previously for removal of a urethral calculus. The dog had been treated with ciprofloxacin for 2 weeks followed by Geocillin for 10 days. The owners reported that stranguria, pollakiuria, and hematuria persisted. When examined, the urethrostomy site was moist and contained a grass awn and there was a palpable hard mass caudal to the os penis. There was moderate thrombocytosis. The urine contained blood and elevated protein. Radiographically, there was a well-circumscribed mineral opacity at the level of the proximal third of the penile urethra that was interpreted as miner-

alization of the urethrostomy site. The urinary bladder was not seen. Sonographically, there was a peripherally hyperechoic, centrally hypoechoic structure present in the urinary bladder (Fig. 2). *S. intermedius* and *Enterococcus faecalis* were isolated from the urine. Clavamox was prescribed to treat the cystitis. A cystotomy was performed and a cystic calculus was removed; when analyzed the calculus consisted of a struvite stone with a plant fiber core.

Hematuria and stranguria developed again 2 years later. A 1 cm blood clot was passed in the urine and the dog became severely stranguric. The bladder was painful to palpation. The urethrostomy site was healed, but dried blood surrounded the site. A small (<1 cm) abrasion was also present near the dorsal rim of the urethral opening. Sonographically, there was a linear, nonshadowing, bifurcating object that appeared to penetrate the cranial wall of the urinary bladder. A cystotomy was performed and a grass awn was removed from the urinary bladder. There was no evidence of bladder perforation.

Dog 3

A 4-month-old 3.6 kg (7.9 lb) neutered male Yorkshire Terrier had developed stranguria, pollakiuria, and hematuria. When examined, the urinary bladder was small and painful and there was pigmenturia. There was mild leukocytosis. The urine was red and hazy; bacteria were not isolated. A positive contrast cystogram was performed and there was a small curvilinear radiolucency ventral to the urinary catheter at the neck of the bladder. Sonographically there was a 3-cm-long, 1-cm-wide oblong hyperechoic foreign body within the urethra that extended into the trigone region of the urinary bladder (Fig. 3). The structure appeared to have a hypoechoic lumen and hyperechoic walls. Echogenic, cellular-appearing material consistent

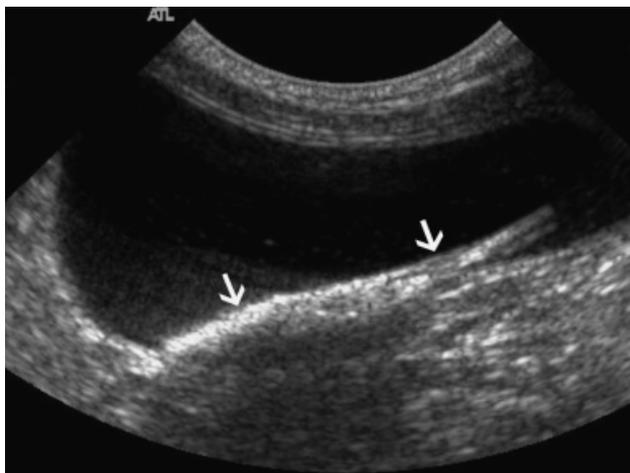


FIG. 1. Sagittal image of the urinary bladder of Dog 1. Note the dependently located, hyperechoic grass awn in the lumen (white arrows). Mild acoustic shadowing is arising from the cranial aspect of the foreign body and there is a double parallel interface caudally.

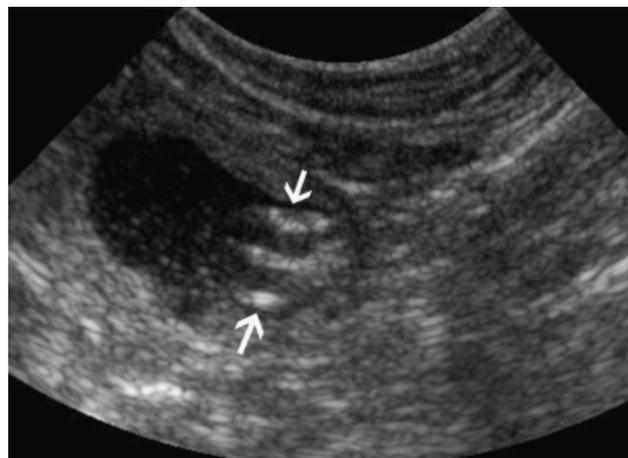


FIG. 2. Transverse image of the urinary bladder of Dog 2; first examination. Arrows indicate a foreign body with a peripheral hyperechoic rim but no shadowing and a central hyperechoic structure. A struvite calculus with a plant material core was removed at surgery.



FIG. 3. Sagittal image of the urinary bladder of Dog 3. A hyperechoic grass awn is delineated by calipers. One end resides in the prostatic urethra (P, prostate). There is no acoustic shadow arising from the grass awn.

with blood was also noted around the cranial aspect of the foreign body. A cystotomy was performed and an approximately 3–4-cm-long grass awn was removed from the trigone of the bladder, protruding from the urethra.

Cat 1

A 10-year-old neutered female domestic long-haired cat weighing 4.5 kg (10 lb) had a 2-day history of stranguria. The abdomen was not painful on palpation and the urinary bladder was small. The urine sediment contained an elevated number of erythrocytes and leucocytes, excessive protein, and long chains of cocci. A gamma streptococcus was isolated from the urine. Sonographically there was a small 1.3 cm linear V-shaped hyperechoic foreign body along the dorsal wall of the urinary bladder (Fig. 4). During cystocentesis, the hyperechoic foreign body was free floating in the bladder. A cystotomy was performed and a grass awn

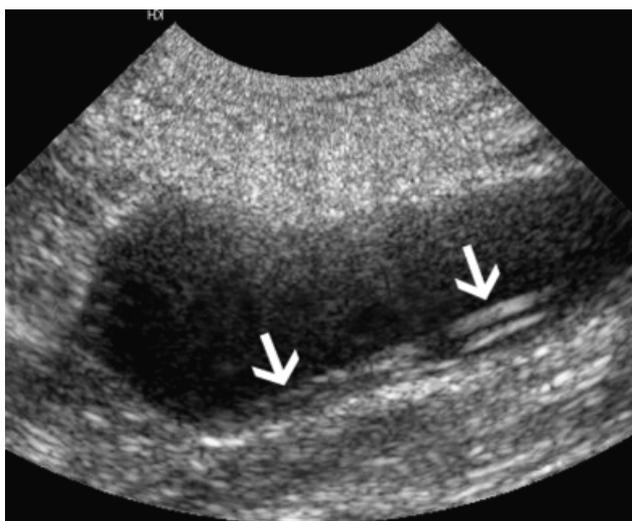


FIG. 4. Sagittal image of the urinary bladder of Cat 1. Note the dependently located, hyperechoic grass awn in the lumen (white arrows). No acoustic shadowing is arising from the grass awn and there is a double parallel interface caudally. The cranial margin is indistinct.

was removed from the neck of the bladder. The bladder wall was of normal thickness and the mucosa was not thickened.

Discussion

There are two possible pathways for grass awns to enter the body. The first is through a body orifice, as in inhalation, the ear canal, and the orbit. Second, the awn may penetrate through intact skin or an open wound resulting in interdigital and subcutaneous abscesses, and may even migrate into a body cavity. We theorize that the route of foreign body entry into the urinary bladder was through the urethral opening. While Dog 2 had undergone scrotal urethrostomy, possibly causing a larger orifice for entry of the grass awn, the other three animals had normal lower urinary tract morphology. Although penetration through the skin or the intestinal tract is possible, this was thought unlikely due to the lack of adhesions of the bladder to the intestinal tract, body wall, or other organs.

There have been numerous noniatrogenic foreign bodies occurring in the urinary bladder in small and large animals and none were grass awns.^{3–7} In these previously described patients, penetration into the urinary bladder was through the detrusor muscle, either from the intestine, via a skin wound, or from the peritoneal cavity. There is one cat reported to have two grass awns in the urinary bladder, but no further information was available.⁸

Interestingly, all three dogs described herein are male Yorkshire Terriers. It is possible that the long hair and size of the dog allowed grass awns to attach and remain in the haircoat. From this stage, once the grass awns migrate to the urethral opening they are able to migrate up the urethra.

The ultrasonographic appearance of grass awns, as described previously,¹¹ is spindle shaped with two to three linear echogenic interfaces. There is occasionally an acoustic shadow in the sagittal imaging plane. Others have described nonenteric grass awns that had no acoustic shadow when imaged ultrasonographically, which was determined to be due to their small size, the low density of the grass awn, and the extent of degradation.²⁰ Ultrasound has been suggested to be superior to conventional and contrast radiography for locating the grass awn.^{11,20} CT has been used for the diagnosis of grass awns in the thorax.¹⁰ Also, in a comparison of radiography, ultrasonography, nuclear scintigraphy, and MR imaging for detection of plant material in the lumbar muscles of six dogs, ultrasound was the only modality that was able to detect the foreign material in three out of six patients.¹⁵ Finally, both CT and MR imaging were unsuccessful in allowing identification of a grass awn in the cervical area in a cat.¹⁶

The ultrasound appearance of grass awns in the bladder is consistent with their appearance in other tissues and in a water bath. The grass awns usually cast an acoustic

shadow, were linear or sometimes V-shaped, and were easy to identify. In the one circumstance where a diagnosis of bladder foreign body was not made (Dog 2, first examination), the lesion was likely chronic based on the presence

of a struvite rim around the grass awn. A diagnosis of chronic bladder foreign body should be considered when a luminal structure with a hyperechoic rim and hypoechoic center is found ultrasonographically.

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