Ultrasonographic findings associated with uterine migrating grass seeds in eleven dogs

Echografische bevindingen geassocieerd met uteriene migrerende grasaren bij elf honden

1C Benzimra, 1L Couturier, 1L Gatel, 1E Cauvin, 2G Gory, 1D Rault

1AzurVet Center of Veterinary Specialists, Diagnostic Imaging Unit, France
769 Avenue Pierre et Marie Curie, 06700 Saint-Laurent-du-Var, France
2Olliolis, Veterinary Referral Center, 40 Chemin du Clos du Haut, 83190 Ollioules, France
caroline.benzimra@gmail.com

ABSTRACT

Numerous locations have been reported for vegetal foreign body migration. However, urogenital migration has rarely been documented. In this retrospective study, the ultrasonographic features associated with intrauterine migrating vegetal foreign bodies (grass seeds) are described in one intact and ten ovariectomized bitches. The most common ultrasonographic finding was focal and mild ampullary dilation of the uterus, containing the foreign body outlined by scant intraluminal fluid. There were no changes seen to the uterine wall, except in one dog with uterine perforation, confirmed at surgery. The remainder of the uterus had a normal appearance in 8/11 dogs, while there was a small amount of intraluminal fluid in 2/11 cases. Mild, focal steatitis around the focal dilation of the uterus segment containing the foreign body was observed in one case. The subtlety of these findings suggests that the ultrasonographic diagnosis of uterine grass awns can be challenging. This underlines a discrepancy with other reported migration sites commonly associated with marked inflammation.

SAMENVATTING

Talrijke locaties werden reeds beschreven wat betreft migratie van plantaardige vreemde voorwerpen, maar urogenitale migratie werd echter zelden gerapporteerd. In deze retrospectieve studie worden de echografische kenmerken geassocieerd met migrerende intra-uteriene vreemde voorwerpen van plantaardige oorsprong (grasaren) beschreven bij elf teven, waarvan tien gesteriliseerd en één intact. De meest voorkomende echografische bevinding bleek focale en milde ampullaire verwijding van de uterus die het vreemd voorwerp bevatte omringd door een kleine hoeveelheid luminaal vocht. Er werden geen abnormaliteiten van de uteruswand gezien. Behalve bij één hond met uterine perforatie werd de abnormaliteit tijdens chirurgie vastgesteld. De overige delen van de uterus hadden een normaal uitzicht bij 8/11 honden, terwijl bij 2/11 gevallen een kleine hoeveelheid luminaal vloeistof werd vastgesteld. Bij drie honden werd milde, focale steatitis waargenomen rondom het vreemd voorwerp. De subtiele echografische bevindingen tonen aan dat de diagnose van een grasaar in de uterus een grote uitdaging kan zijn. Dit in groot contrast met andere beschreven locaties van migratie waarbij meestal zeer duidelijke tekenen van inflammatie worden vastgesteld.

INTRODUCTION

Migrating vegetal foreign bodies (FB) have been largely documented in the veterinary literature, with common sites including the ear canal, nasal cavity, eye and eyelids, subcutaneous space, peritoneal and retroperitoneal spaces, thoracic airways and pleura or interdigital space (Brennan and Ihrke, 1983; Schultz and Zwingenberger, 2008; Cherbinsky et al., 2010; Vansteenkiste et al., 2014; Caivano et al., 2016; Fau-
at least partially in the vagina or cervix. Clinical data performed, which suggested that the FB was located when an ultrasound-guided retrieval procedure was performed, which suggested that the FB was located at least partially in the vagina or cervix. Clinical data

In this retrospective case series, the database of two referral private practices, i.e. Azurvet, Center of Veterinary Specialists and Olioli’s, Veterinary Referral Center (France) was searched for intrauterine vegetal FBs. Both referral practices were located in the South East of France. Patients were included if the ultrasonographic examination revealed an intrauterine vegetal FB, that was subsequently confirmed at surgery, between April 2011 and January 2020. Exclusion criteria were a vaginal location of the FB or when an ultrasound-guided retrieval procedure was performed, which suggested that the FB was located at least partially in the vagina or cervix. Clinical data collected from the animal’s medical reports included clinical signs at presentation, breed, age, body weight, sexual status (intact versus neutered) and ultrasonographic findings. Ultrasonographic examinations were performed by an ECVDI diplomate or ECVDI associate member, highly experienced in the ultrasonographic diagnostics and management of migrating grass seeds as frequently encountered in this geographic area. Scans were performed using TOSHIBA Aplio 400, TOSHIBA Aplio 600, ESAOTE MyLab 60 and PHILIPS CX50 ultrasound machines. Ultrasound reports, images and recorded videos, when available, were retrospectively evaluated for each included animal, in order to provide a detailed description of the ultrasonographic features.

**RESULTS**

Eleven dogs were included in the study. Ten bitches had been neutered via ovarioectomy without hysterectomy, and one was intact. Ages ranged from ten months to fourteen years old (median seven years old). Represented breeds included Yorkshire terrier, Lhassa Apso, Bichon Frisé, West Highland White terrier, Griffon hunting dog Wirehaired Pointing Griffon, two Border collies and four mixed breed dogs. Body weights ranged from 5kg to 25kg (median 8kg).

In all animals, the clinical signs were characterized by hemorrhagic or purulent vulvar discharge and vulvar discomfort. The duration of the clinical signs prior to referral was not documented in all cases. A chronic evolution of over three weeks had been recorded in three bitches (three weeks in two bitches and five weeks in one bitch).

In the ten neutered dogs, the spindled-shaped ultrasonographic image typical of grass seeds (most likely
consistent with *Avena sterilis sp.* was observed, and was identified in the left uterine horn in six animals and in the right uterine horn in four animals (Figure 1). One of these dogs presented with two overlapping FBs within the right uterine horn.

The size of the FBs ranged from 12 to 32 mm in length (median 20 mm) and from 1.7 to 5.5 mm in width (median 3 mm). In all ten dogs, a very small amount of intraluminal fluid was present surrounding the FB, making it more conspicuous. Focal ovoid dilatation of the uterus was noted at the location of the intraluminal FB, ranging from 2.8 to 8.1 mm in diameter (median 5 mm), depending on the cross-sectional diameter of the foreign body. In 8/10 dogs, intraluminal fluid was only localized around the FB, whereas the two remaining dogs showed mild diffuse accumulation of fluid in the entire uterine lumen.

In 9/10 dogs, the focally dilated uterine segment exhibited a homogeneous wall, with normal wall thickness and echogenicity, similar to the adjacent, unaffected uterine segments. The uterine wall layers could not be differentiated in either affected or unaffected uterine segments (Figure 2A). In 1/10 dogs, the report did not specify the appearance of the uterine wall at the level of the FB.

In 8/10 dogs, the uterine segments remote from the FB were reported to be unremarkable. Mild focal hyperechogenicity of the peritoneal fat surrounding the uterine segment containing the FB was noted in 1/10 dogs. In 1/10 dogs, the report did not specify the appearance of the uterus remote from the FB.

The intrauterine FB was identified as an *Avena sterilis* spikelet in all ten neutered dogs (Figures 2B and 2C).

In the intact dog, multiple hyperechoic foci and linear interfaces associated with acoustic shadowing were observed within the lumen of the cranial part of the uterine body (Figure 3A). At this level, the uterine wall was markedly thickened, forming a mass. There was no layering on the ventral aspect of the lesion, consisting of an inner, hypoechoic layer and an outer, more echogenic layer (Figure 3A). Focal moderate hyperechogenicity of the surrounding peritoneal fat was noted around the mass (Figure 3B). Even though there was no ultrasonographic evidence of uterine perforation, this was subsequently detected during the ovariohysterecomy performed by the referring veterinarian. The FB was identified as a *Poa pratensis* spikelet (Figure 3C).

**DISCUSSION**

The presence of grass seeds in the vagina has been described previously (Gatel et al., 2014). Cranial migration of spikelets from the vaginal vestibule is caused by the stiff, reverse barbs that promote forward movement while preventing backward motion (Brennan and Ihrke, 1983; Schultz and Zwingenberg, 2008; Gatel et al., 2014). In the present cases, the plant material most likely migrated from the vagina, through the cervix and into the uterine horns. In fact, uterine cannulation can be performed at any stage of the reproductive cycle in bitches (Watts and Wright, 1995), which suggests that the uterine cervix may be patent to the migration of small vegetal FBs irrespective of the hormonal cycle of the dog. The close proximity of the vulva to the ground in female dogs during micturition might promote the penetration of grass seeds into the vulva, as previously suggested (Gatel et al., 2014). This proximity may be exacerbated in small dogs, and could be the reason for the overrepresentation of dogs weighing < 10kg in the present study (8/11).

Ascending and descending contractions of the vagina and uterus during estrus and anestrus have been documented, and could have contributed to the retrograde migration in the intact bitch (Brennan and Ihrke, 1983; Chatdarong et al., 2006; Snead et al., 2010; Gatel et al., 2014). The patency of the cervix is also increased during proestrus and estrus, parturition, and the post-partum period up to sixty days after parturition (Allen and France, 1985; Silva et al., 1995; Verstegen et al., 2001; De Cramer and Nöthling, 2017).
However, the stage of the estrus cycle when the penetration and migration of the FB occurred in the intact bitch described in this series was not recorded at the time of presentation. Moreover, the exact duration of the clinical signs was not recorded, which prevents an estimation of the stage of the cycle.

In the present study, the majority of bitches (10/11) had been neutered via ovariectomy only. Currently, ovariectomy is the recommended surgical neutering prophylactic procedure in healthy bitches in France, according to the guidelines of the French Central Canine Society (https://www.centrale-canine.fr). The reason why ovariectomy is preferred in France rather than ovariohysterectomy is poorly documented, but ovariectomy seems to be a historically preferred technique. This surgical preference makes observation of intrauterine migration of foreign body more likely in France and some other European countries than in Northern American countries, where ovariohysterectomy is usually performed (DeTora and McCarty, 2011).

In all neutered dogs of the present series, the FBs were identified as being *Avena sterilis* spikelets. Ultrasonographic features of the grass seeds were consistent with previous descriptions (Staudte et al., 2004; Gnudi et al., 2005). In these cases, focal dilatation of the uterine horn, centered on the FB, helped to recognize the affected segment of the uterine horn; however, the ultrasonographic changes were very mild and localized. This is in contrast with descriptions of *Avena* spp. migration in other locations, which is generally associated with a marked inflammatory reaction, such as pyothorax, subcutaneous cellulitis or abscesses (Gnudi et al., 2005; Vansteenkiste et al., 2014) coughing (28%). In a previous study by Gatel et al. (2014), mild ultrasonographic changes associated with vaginal migration of vegetal grass seeds has also been reported in a spayed dog and a cat, even though it was suspected that the spikelet had already been in the vaginal lumen of the dog for at least two years.

The reason for this limited inflammatory reaction associated with genital migration of FB may be explained by the tubular and confined aspect of the uterus and vagina, and also by the discharge of inflammatory fluid via the vulva, observed in all dogs in this study. However, an increased tolerance of the uterus to the FB compared to other migration sites cannot be ruled out. Moreover, the absence of hormonal impregnation in the ovariectomized dogs in this study may have limited the inflammatory focal response to the vegetal FB, as hormones, progesterone in particular, are known to be implicated in the development of uterine diseases such as pyometra (Hagman, 2018). The impact of hormonal impregnation in the intact dog of the present series could not be determined, as the stage of its cycle was not recorded at the time of diagnosis.

Pyometra associated with an non-vegetal intrauterine FB has been reported, including in association with a retained swab fragment in a bitch (Ajadi et al., 2018). Endometrial hyperplasia and bacterial endometritis have also been reported in a guinea pig with an intra-uterine piece of hay (Kohutova et al., 2018). None of the neutered bitches in the present study showed any ultrasonographic abnormalities of the uterine wall. Two dogs in the study had a scant amount of diffuse intraluminal fluid, which could indicate endometritis or early pyometra. However, no cytological or bacteriological examination of the fluid was performed following the diagnosis of intrauterine vegetal FB.

In the present case series, only one intact bitch was included. The plant material retrieved at surgery was identified as a *Poa pratensis* spikelet, rather than the *Avena* spp. found in all the other dogs. To the authors’ knowledge, this plant has not been reported as a migrating FB and has therefore never been described ultrasonographically. It had a non-characteristic appearance, consisting in multiple hyperechoic foci and linear interfaces, making the ultrasonographic diagnosis more challenging. This case presented with thickening of the uterine body and parietal alterations, consisting in marked uterine wall thickening and pseudo-layering. This may be explained by several factors,
including the hormonal status of the bitch, the different nature of the FB and the uterine wall perforation detected at surgery.

In human medicine, different complications can occur as a result of FB migration within the vagina or uterus, especially with intra uterine contraceptive devices, including perforation, fistulation or aberrant migration (Magudapathi et al., 2015; Huang et al., 2019; Li et al., 2019). Complications such as urethrovaginal fistula secondary to a migrating grass seed (Agut et al., 2016) or uterine perforation and metritis with severe uterine adhesions, secondary to intramural retained fetal material (Watson et al., 2016), have been reported in bitches. Uterine perforation in dogs has also been described secondary to trauma during pregnancy, uterine torsion, dystocia, pyometra and surgical scars (Hajurka et al., 2012; Voorwald et al., 2012; Watson et al., 2016). However, to the authors’ knowledge, rupture or perforation of the uterus secondary to a migrating grass seed has previously not been reported in dogs.

The ultrasonographers that took part in the present study were highly experienced in the ultrasonographic detection of migrating grass seeds in small animals due to the high incidence of grass seeds around the Mediterranean Sea. In the authors’ experience, the diagnosis of intrauterine vegetal FBs is considered challenging compared to more common migration sites. The subtle features noted in the majority of cases in the present study required a meticulous evaluation of the entire length of the uterine horns. The overrepresentation of small-sized, ovariectomized bitches in the affected population added extra difficulties, including the small diameter of the uterus and the random position of the uterine horns permitted by the section of the ovarian ligaments during ovarioectomy. Finally, the absence of systematic warning signs such as peritoneal steatitis surrounding the affected horn or marked focal uterine dilatation could not be used to attract the attention of the operator to the FB.

The limitations of this study are mainly related to its retrospective nature. No histologic examination of the uterine horns containing the FB was performed, which prevented a comparison between the ultrasonographically normal uterine walls and the presence of potential microscopic evidence of metritis or endometritis. Additionally, the nature of the focal fluid outlining the FB and potential bacterial contamination were not documented by the referring veterinarians who performed the hysterectomy. Limited recorded data were available regarding the treatment received by the animals prior to referral, and their potential impact on the severity of the changes. Finally, all animals were referred specifically for ultrasonographic examination, without a prior specific clinical examination of the reproductive tract.

In conclusion, intrauterine vegetal FBs should be included in the differential diagnosis in any female dog with vulvar discharge, especially if ovariectomized and living in a geographic area where migrating grass seeds are a common problem. Ultrasonographic findings in intra-uterine migrated vegetal FBs (grass seeds in the current cases) differ from those in other, more common sites of migration, since the changes observed were mostly very localized and mild. Notably, the absence of visible uterine wall abnormalities and a normal appearance of the uterus outside of the FB location were a common finding in the present study. Moreover, the ultrasonographic diagnosis of vegetal FB was found to be more difficult in the case of the atypical Poa spp. grass-seed. The paucity of ultrasonographic changes in most cases hence require a meticulous examination of the entire uterus in dogs suspected of intrauterine vegetal FB.

ACKNOWLEDGEMENTS

The authors thank Dr Xavier Levy (DipECAR-EBVS) for his valuable suggestions.

REFERENCES

Agut A., Carrillo J.D., Anson A., Belda E., Soler M. (2016). Imaging diagnosis-urethrovaginal fistula caused by a migrating grass awn in the vagina. *Veterinary Radiology & Ultrasound* 57 (3), E30-33.

Ajadi T.A., Makinde F.A., Adebayo O.O., Adeleye A.I. (2018). Incidence, indication and prognosis of ovariohysterectomy in dogs in Abeokuta, Nigeria. *Sokoto Journal of Veterinary Sciences* 16 (2), 47.

Allen W. E., France C. (1985). A contrast radiographic study of the vagina and uterus of the normal bitch. *Journal of Small Animal Practice* 26 (3), 153-166.

Brennan K. E., Ihrke P. J. (1983). Grass awn migration in dogs and cats: A retrospective study of 182 cases. *Journal of the American Veterinary Medical Association* 182 (11), 1201-1204.

Caivana D., Birettoni F., Rishniw M., Bufalari A., De Monte V., Proni A., Giorgi M.E., Porciello F. (2016). Ultrasonographic findings and outcomes of dogs with suspected migrating intrathoracic grass awns: 43 cases (2010-2013). *Journal of the American Veterinary Medical Association* 248 (4), 413-421.

Chatdarong K., Lohachat C., Kiartmanakul S., Axnér E., Forsberg C.L. (2006). Cervical patency during non-ovulatory and ovulatory estrus cycles in domestic cats. *Theriogenology* 66 (4), 804-810.

Cherbinsky O., Westropp J., Tinga S., Jones B., Pollard R. (2010). Ultrasonographic features of grass awns in the urinary bladder. *Veterinary Radiology & Ultrasound* 51 (4), 462-465.

De Cramer K.G.M., Nöthling J.O. (2017). The precision of peri-estrous predictors of the date of onset of parturition in the bitch. *Theriogenology* 96, 153-157.

Del Signore F., Terragni R., Carloni A., Stehlik L., Proks P., Cavallo L., Febo E., Luciani A., Crisi P.E., Vignoli M. (2017). An uncommon localization of a vegetal foreign body in a dog: A case report. *Veternární Medicína* 62, 579-582.
DeTaora M, McCarthy R.J. (2011). Ovariohysterectomy versus ovarioectomy for elective sterilization of female dogs and cats: is removal of the uterus necessary? Journal of the American Veterinary Medical Association 239 (11), 1409-1412.

Fabbri M, Manfredi S, Di Ianni F, Bresciani C, Cantoni A, Gnudi G, Bigliardi E. (2014). A vaginal foreign body in a bitch: A case report. Veterinární Medicína 59 (9), 457-460.

Fauchon E., Lassaigne C., Ragetly G., Gomes E. (2017). Ultrasound-guided removal of vegetal foreign bodies in the lower extremities of dogs: a retrospective study of 19 cases. Vlaams Diergeneeskundig Tijdschrift 86, 285-290. Frendin J., Funkquist B., Hansson K., Lönnemark M., Carlsten J. (1999). Diagnostic imaging of foreign body reactions in dogs with diffuse back pain. Journal of Small Animal Practice 40(6), 278-285.

Gate L., Gory G., De Pauw B., Rault D.N. (2014). Diagnosis and Ultrasound-Guided retrieval of a vaginal foreign body in a dog and a cat. Vlaams Diergeneeskundig Tijdschrift 83 (5), 55-58. Gnudi G., Volta A., Bonazzi M., Gazzola M., Bertoni G. (2005). Ultrasonographic features of grass awn migration in the dog. Veterinary Radiology & Ultrasound 46 (5), 423-426.

Hagman R. (2018). Pyometra in small animals. The Veterinary Clinics of North America. Small Animal Practice 48 (4), 639-661.

Hajurka J., Macak V., Hura V., Stavova L., Hajurka R. (2012). Spontaneous rupture of uterus in the bitch at parturition with evisceration of puppy intestine - A case report. Veterinární Medicína 50 (2), 85-88.

Huang X., Zhong R., Zeng L., He X., Deng Q., Peng X., Li J., Luo X. (2019). Chronic nodules of sigmoid peritonitis caused by incarcerated intrauterine contraception device. Medicine 98 (4), e14117.

Kohoutova, Silvia, Michaela Paninarova, Miša Škorič, Vladimir Jekl, Zdenek Knotek, et Karel Hauptman. (2018). Cystic endometrial hyperplasia and bacterial endometritis associated with an intrauterine foreign body in a guinea pig with ovarian cystic disease. Journal of Exotic Pet Medicine 27 (1), 41-45.

Li X., Li H., Li C., Luo X, Song Y., Li S., Luo S., Wang Y. (2019). Migration of an intrauterine device causing severe hydronephrosis progressing to renal failure: A case report. Medicine 98 (3), e13872.

Magudapathi C., Manickam R., Thangavelu K. (2015). Vesicocervical Fistula: Rare complication secondary to intrauterine device (Lippes Loop) erosion » International Urogynecology Journal 26 (6), 927-929.

Marchegiani A., Fruganti A., Cerquetella M., Cassarani M.P., Laus F., Spaterna A. (2017). Penetrating palpebral grass awn in a dog: Unusual case of a penetrating grass awn in an eyelid. Journal of Ultrasound 20 (1), 81-84.

Schultz R.M., Zwingenberger A. (2008). Radiographic, computed tomographic, and ultrasonographic findings with migrating intrathoracic grass awns in dogs and cats. Veterinary Radiology & Ultrasound 49 (3), 249-255.

Silva L.D., Onclin K., Verstegen J.P. (1995). Cervical opening in relation to progesterone and estradiol during heat in beagle bitches. Journal of Reproduction and Fertility 104 (1), 85-90.

Snead E.C., Pharr J.W., Ringwood B.P., Beckwith J. (2010). Long-retained vaginal foreign body causing chronic vaginitis in a bulldog. Journal of the American Animal Hospital Association 46 (1), 56-60.

Staudte K.L., Hopper B.J., Gibson N.R., Read R.A. (2004). Use of ultrasonography to facilitate surgical removal of non-enteric foreign bodies in 17 dogs. Journal of Small Animal Practice 45 (8), 395-400.

Vansteenkiste D. P., Lee K.C.L., Lamb C.R. (2014). Computed tomographic findings in 44 dogs and 10 cats with grass seed foreign bodies. Journal of Small Animal Practice 55 (11), 579-584.

Verstegen J.P., Silva L.D., Onclin K. (2001). Determination of the role of cervical closure in fertility regulation after mating or artificial insemination in Beagle bitches. Journal of Reproduction and Fertility Supplement 57, 31-34.

Voorwald F., Tiosso C.F., Cardilli D., Toniollo G.H. (2012). Mummified papillary feticuses in the abdominal cavity of an elderly female dog with pyometra. Arquivo brasileiro de Medicina Veterinària e Zootecnia 64 (2), 311-317.

Walker C.E. (1978). Foreign body in Pekinese uterus. The Veterinary Record 103 (25), 567.

Watson K.M., Horadagoda N.U., Piripi S.A. (2016). Dachshund bitch with severe uterine adhesions and intramural uterine foreign material as an incidental ovariohysterectomy finding. Australian Veterinary Journal 94 (1-2), 24-26.

Watts J.R., Wright P.J. (1995). Investigating uterine disease in the bitch: Uterine cannulation for cytology, microbiology and histocytology. Journal of Small Animal Practice 36 (5), 201-206.

Wolf A. (1978). Intrauterine foreign body in a dog. Veterinary Medicine, Small Animal Clinician 73 (4), 478.