Percutaneous laser disc decompression in the treatment of detrusor-urethral dyssynergia in a female German Shepherd: a case report

S. Lew-Kojrys[1], Z. Adamiak[1], A. Pomianowski[1], W. Maksymowicz[2], M. Barczewska[2], A. Majchrowski[2]

[1]Faculty of Veterinary Medicine, University of Warmia and Mazury, Olsztyn, Poland
[2]Faculty of Medical Sciences, University of Warmia and Mazury, Olsztyn, Poland

ABSTRACT: A 7-year-old female, German Shepherd with urinary and faecal voiding difficulties was admitted to the clinic. The patient was subjected to neurological, ultrasonographic and radiological examinations as well as blood and urine tests. Based on clinical observations and test results, the dog was diagnosed with detrusor-urethral dyssynergia. The prescribed pharmacological treatment consisted of alpha adrenergic receptor antagonists and skeletal muscle relaxants. The patient was catheterised daily, and Foley's catheter was temporarily inserted. Pharmacological treatment was not effective, however, and the patient was subjected to an MRI examination of the lumbosacral spine which revealed L6–L7 dyscopathy. The dog was then subjected to percutaneous laser disc decompression. Pharmacological treatment was continued, and the catheter was left in place after surgery. Active urination was restored four days after surgery despite the presence of the catheter. The catheter was subsequently removed, and pharmacological treatment was gradually discontinued. The symptoms of dyssynergia subsided completely.

Keywords: detrusor-urethral dyssynergia; dog; PLDD; magnetic resonance

Micturition disorders result from a dysfunction in the storage or voiding of urine, and they may be functional or structural in origin. Structural urine storage problems include developmental defects of the urinary and reproductive systems, such as urethral dislocation, persisting urachus, vestibulo-vaginal stenosis and undeveloped bladder. Functional disorders involve urethral sphincter mechanism incompetence.

Micturition dysfunctions of structural origin include urethral obstruction caused by urinary tract calculi, proliferation of neoplasms, urethral trauma, chronic urethral inflammations and prostatic diseases. Functional problems are most often associated with damage of central and peripheral motor neurons, and they are manifested by bladder atony or a spastic urethral sphincter (Bradlewy and Timm 1974).

Detrusor-urethral dyssynergia poses the greatest diagnostic and therapeutic challenge in the context of micturition disorders. The disorder is often diagnosed based on interviews, micturition observations and the results of imaging and laboratory tests to rule out the functional and structural causes of dysuria (Diaz Espineira et al. 1998). Dyssynergia is diagnosed when urination begins correctly, but urine flow is suddenly interrupted or voiding is restricted to several drops of urine. Detrusor contraction stimulates urethral spasms, and increased pressure in the urinary tract obstructs micturition (Blackwenll 1993). Dyssynergia of the detrusor and urethral sphincter muscles may be caused by changes in the reticulospinal tract, changes in the cranial mesenteric ganglion relative to the caudal mesenteric ganglion, elimination or weakening of the inhibitory effect of micturition centres in the pons and the brainstem on sympathetic and somatic reflex centres in the sacral spine. Dyssynergia may also have idiopathic origins. Other causes of

the disorder include damage to the upper motor neuron and the cauda equina syndrome (Lane et al. 2000).

The clinical symptoms of the disease involve painful and obstructed urine flow, voiding dysfunction, voiding by droplets of urine or interrupted urine stream. The symptoms associated with dyssynergia are similar to those noted in urethral obstruction caused by urinary tract calculi. Overdistention of the urinary bladder may lead to detrusor atony (Barsanti et al. 1996; Gookin 1996).

Treatment involves reducing the resistance of inner and outer urinary sphincters. Patients are administered alpha adrenergic receptor antagonists (prazosin, phenoxybenzamine), somatic muscle relaxants (diazepam) and, in cases of secondary atony, parasympathetic-mimetic drugs (betanechol) (Poirer et al. 1988; O'Donnell 1990). The bladder is voided daily by aseptic catheterisation or a permanent catheter is inserted when bladder contraction needs to be restored after atony. Many patients respond to pharmacological treatment only after several days, and dose modification may be required (Gajewski et al. 1984).

Very few methods for the treatment of detrusor-urethral dyssynergia have been described in the literature. Ineffective long-term pharmacological therapy and multiple catheterisations can lead to secondary infections of the urinary tract, and some owners choose euthanasia to prevent further suffering (Nishizawa et al. 1987).

Case description

A 7-year-old female German Shepherd with a body weight of 38 kg was admitted to the Internal Diseases Clinic with symptoms of micturition difficulty. The patient underwent detailed clinical and neurological examinations. According to the owner, micturition problems had intensified prior to admittance and the dog had difficulty with starting a urine stream or voided only several drops of urine at a time. The patient was agitated and vocalised its discomfort. Shortly before admittance, the dog had also experienced faecal voiding problems. The bladder was strongly distended, tense and painful upon palpation. A reflex test did not reveal any neurological deficits. The patient was subjected to ultrasonographic and radiological examinations using contrast media, blood morphology and biochemistry tests, urine tests (physicochemical and microbiological) and thyroid function tests. The dog was catheterised to empty the bladder and evaluate urethral patency. Retro-bladder obstructions were not observed along the course of the urethra. An X-ray examination revealed degenerative changes in the spine. The results of blood and urine tests were within the reference ranges. An ultrasonographic evaluation did not reveal any changes that could lead to micturition difficulties.

Based on the information obtained during the interview, the observations of the patient's attempts at urination and additional tests that ruled out the structural causes of dysuria, the dog was diagnosed with detrusor-urethral dyssynergia. The animal was then subjected to pharmacological treatment consisting of alfuzosin (Dalfaz, Sanofi-Aventis) (prazosin is not registered in Poland) at an initial dose of 0.1 mg/kg bw *p.o.* every 12 h and diazepam (Relanium, Polfa-Warszawa) at 0.2 mg/kg bw *p.o.* every 8–12 h administered 30 min prior to dog walking. The patient was catheterised daily for the first five days, after which a 16 Chr Foley catheter was inserted. Antibiotic cover during urethral catheterisation involved amoxicillin with clavulanic (Synulox, Pfizer) acid at 12.5 mg/kg bw administered per os every 12 h. Due to degenerative changes, pharmacological treatment was supplemented with prednisolone at 1 mg/kg bw *p.o.* every 24 h. Bladder emptying resolved the bowel movement problems. The patient's condition was described as highly satisfactory. The catheter was removed every few days and micturition reflexes were observed. Pharmacological treatment failed to deliver the anticipated results, however. The dog was subjected to an MRI evaluation of the lumbosacral spine using an MR scanner with a strength of 0.25 Tesla (Vet Grande, Esaote, Italy). The MRI procedure was performed in sagittal and transverse planes using FSE REL (TR 3000, TE 120), X BONE (TR 970, TE 28) and Gradient Echo (GE) sequences. Extrusion of the intervertebral disc between L6–L7 was observed in sagittal and transverse planes (Figure 1). Surgical treatment of the herniated disc was performed under general anaesthesia. The patient was positioned in sternal recumbency. The puncture needle was inserted into the L6–L7 intervertebral disc space under C-arm monitoring (Figure 2). During PLDD, and a photofibre was implanted in the herniated disc using the Medilas D MultiBeam (Dornier, Germany) laser device with an output of up to 80 W and a 980 nm diode (Sato et al. 2001). The herniated nucleus pulposus was vaporised. Betamethasone

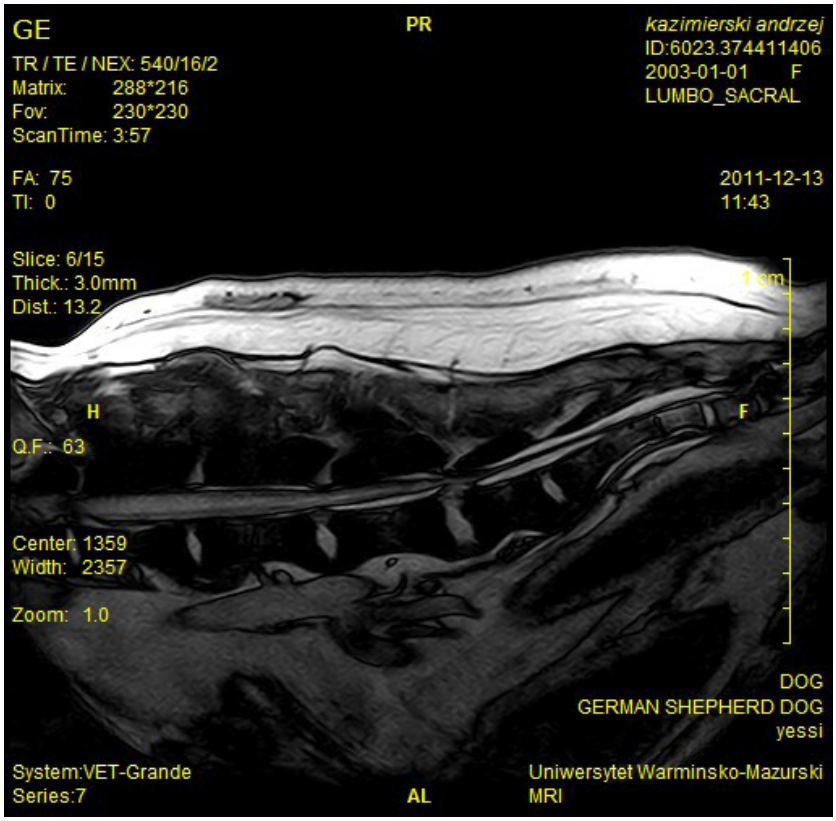

Figure 1. Magnetic resonance image of the treated dog in FSE REL sequence (TR 3720, TE 120) in sagittal view with prolapsed intervertebral disc on L6–L7 level

(Diprophos – Schering plough PLOUGH) was administered at 3.5 mg into the disc space to minimise the inflammation, reduce the swelling and prevent postoperative scars (Iwatsuki et al. 2005; Kobayashi et al 2007). Urination began four days after MRI surgery despite the presence of a catheter. The catheter was removed and pharmacological treatment was discontinued over a period of two weeks by gradually reducing the prednisolone dose. The symptoms of dyssynergia subsided completely.

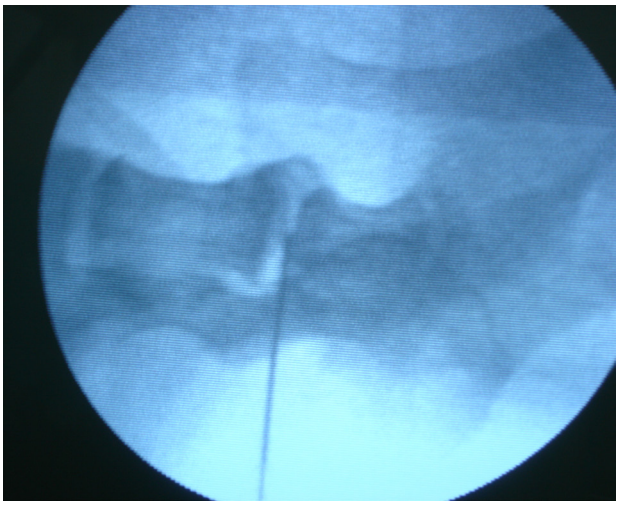

Figure 2. C-arm view with intramedullary needle in L6–L7

DISCUSSION AND CONCLUSIONS

Lower urinary tract dysfunctions are often difficult to diagnose due to the complexity of neuroregulatory processes and their mutual interactions. Dyssynergia may affect the striated muscle of the external urethral sphincter, the smooth muscle of the internal urethral sphincter or both. Detrusor-urethral dyssynergia remains poorly investigated, and it is generally believed to be an idiopathic disease. The disorder is more often diagnosed in male dogs of large breeds than in females. The symptoms of dyssynergia may be triggered by sexual stimulation in the presence of a female dog in heat or by prostatic hypertrophy. Castration is a method of choice in the prevention of dysuria. Chronic inflammations may lead to local irritations and urethral spasms. In a study by Holt, striated muscle dyssynergia in bitches subjected to colposuspension surgery was effectively treated with diazepam (Moreau 1990).

Detrusor-urethral dyssynergia is diagnosed by observing urination behaviour and ruling out the structural causes of dysuria. Urodynamic tests measuring urethral pressure are a helpful tool in the diagnostic process. In the discussed patient, micturition was correctly initiated, but it was dis-

rupted by urethral spasms (Nishizawa et al. 1987). Ultrasonographic and radiographic examinations with the use of contrast media ruled out structural changes in the lower urinary tract and other systemic diseases which are manifested by polydipsia and polyuria. Based on the initial diagnosis, standard treatment consisting of alpha adrenergic receptor antagonists and diazepam was prescribed. Pharmacological treatment failed to deliver the anticipated effects, and further tests were performed to determine other causes of micturition difficulties. The dog was subjected to an MRI examination which revealed a herniated intervertebral disc without a fibrous ring tear that exerted pressure on the caudal nerve fibres. Percutaneous laser disc decompression surgery was performed despite the fact that symptoms of intervertebral disc disease were not observed in a neurological examination (Sato et al. 2001). The symptoms of dyssynergia disappeared four days after surgical treatment. The cause of urination difficulties were blocked nerve impulses in the reticulospinal tract.

REFERENCES

Barsanti JA, Coates JR, Bartges JW (1996): Detrusor sphincter dyssynergia. Veterinary Clinics of North America: Small Animal Practice 26, 327–336.

Blackwenll J (1993): Reflex dyssynergia in the dog. Veterinary Record 132, 516–519.

Bradlewy E, Timm GW (1974): Physiology of micturition. Veterinary Clinics of North America: Small Animal Practice 4, 487–500.

Diaz Espineira MM, Viehoff FW, Nickel RF (1998): Idiopathic detrusor-urethral dyssynergia in dogs: a retrospective analysis of 22 cases. Journal of Small Animal Practice 39, 264–270.

Gajewski J, Downie JW, Awad SA (1984): Experimental evidence for a central nervous system site of action in the effect of alpha-adrenergic blockers on the external urinary sphincter. Journal of Urology 133, 403–409.

Gookin JL, Bunch SE (1996): Detrusor-striated sphincter dyssynergia in a dog. Journal of Veterinary Internal Medicine 10, 339–344.

Iwatsuki K, Yoshimine T, Sasaki M (2005): The effect of laser irradiation for nucleus pulposus: an experimental study. Neurological Research 27, 319–323.

Kobayashi S, Uchida K, Takeno K (2007): A case of nerve root heat injury induced by percutaneous laser disc decompression performed at an outside institution: technical case report. Neurosurgery 60, 171–172.

Lane IF, Fischer JR, Miller E (2000): Functional urethral obstruction in 3 dogs: clinical and urethral pressure profile findings. Journal of Veterinary Internal Medicine 14, 43–49.

Moreau PM (1990): Disorders of the lower urinary tract in old dogs. Veterinary Record 126, 415–425.

Nishizawa O, Matsuzaki A, Kohama T (1987): Role of the pelvic nerve in the dynamics of micturition in the decerebrate dog as determined by suprapubic endoscopical and urodynamic evaluation. Journal of Urology 138, 442–445.

O'Donnell PD (1990): Central actions of bethanechol on the urinary bladder in dogs. Journal of Urology 143, 634–637.

Poirier M, Riffaud JP, Lacolle JY (1988): Effects of five alphablockers on the hypogastric nerve stimulation of the canine lower urinary tract. Journal of Urology 140, 165–167.

Sato M, Ishihara M, Arai T (2001): Use of a new ICG-dye-enhanced diode laser for percutaneous laser disc decompression. Lasers in Surgery and Medicine 29, 282–287.

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Corresponding Author:

Zbigniew Adamiak, University of Warmia and Mazury in Olsztyn, Faculty of Veterinary Medicine, Department of Surgery and Roentgenology, ul.Oczapowskiego 14, 10-719 Olsztyn, Poland
Tel. +48 602 291 873, E-mail: zbigniew.adamiak@wp.pl