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ETIOLOGY, SYMPTOMS AND TREATMENT OF UTERINE TORSION IN DOMESTIC ANIMALS

ETIOLOGIA, OBJAWY KLINICZNE ORAZ LECZENIE SKRĘTU MACICY U ZWIERZĄT DOMOWYCH

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Streszczenie. Skręt macicy to schorzenie występujące u prawie wszystkich zwierząt domowych dość rzadko, z wyjątkiem bydła. Problem ten występuje najczęściej w drugiej połowie ciąży lub w trakcie porodu jako przyczyna niestosunku porodowego. Opisany jest jako skręcenie się narządu prostopadle do jego osi długiej. Nie wyjaśniono w wystarczający sposób etiologii tej choroby, wydaje się jednak, iż czynnikiem ryzyka predysponującym do skrętu jest niestabilność ciężarnej macicy. Zewnętrzne objawy kliniczne nie są specyficzne. Diagnozy problemu dokonuje się poprzez badanie przez pochwę, badanie rektalne oraz metodami obrazowania jamy brzusznej. U zwierząt gospodarskich leczenie ukierunkowane jest na pozostawienie funkcjonującej macicy, w związku z czym postępowanie chirurgiczne nie jest techniką z wyboru. Wykorzystuje się takie metody, jak ręczne odkręcanie narządu przez pochwę, użycie drażka odkręcającego oraz przetaczanie zwierzęcia przez jego oś długą. Jeżeli przedstawione sposoby okażą się nieskuteczne, wykonywany jest zabieg operacyjny. U psów i kotów postępowaniem z wyboru jest leczenie chirurgiczne. Do niedawna preferowanym postępowaniem u małych zwierząt był zabieg usunięcia macicy wraz z jajnikami, co uniemożliwiało dalszy rozród tych zwierząt. Obecnie stosuje się również nową technikę – jednostronne usunięcie jajnika i rogu macicy.

Key words: bitch, cow, mare, treatment, uterine torsion, queen.

Słowa kluczowe: klacz, kotka, krowa, leczenie, skręt macicy, suka.

INTRODUCTION

Uterine torsion is defined as twisting of the uterus or uterine horn perpendicular to its long axis (Biller and Haible 1987; De La Puerta et al. 2008). It is a non-common problem in almost all domestic species other than cattle (Misumi et al. 2000) and has been only rarely reported in dogs and cats. The condition is life threatening for the mother as well for the foetuses. The foetus and foetal membranes also rotate with the uterus, what can cause the compression

of blood vessels supplying the foetus, hemorrhage or seepage of blood in the allantoic cavity and resultant death of the foetus in utero. Uterine torsion is a diagnostic dilemma and a relatively difficult obstetric procedure. If occurs in pregnant females is a serious complication of gestation period. Early recognition and intervention are essential to optimizing the chance of survival.

The purpose of the paper is to present the current approach to this pathological condition among different species of domestic animals.

COWS

In cattle uterine torsion occurs usually during late 1st or early 2nd stage of labour. It is one of the frequent maternal causes of dystocia in this species. Approximately 30% of uterine torsions happen in heifers and 70% in cows (Aubry et al. 2008). It is explained by the larger abdominal cavity, stretching of pelvic ligaments, long and loose broad ligaments together with loosening of uterine tissue and decreased tone of uterine wall in older animals. The instability of the gravid uterus seems to be the main factor predisposing to this condition (Aubry et al. 2008). The way of lying down and rising, increased foetal movement in the first stage of labour, sudden push from another cow, decreased amounts of uterine fluid, flaccid uterine wall, a small non-gravid horn, excessive foetal weight and poor maternal muscles can be the causes (Drost 2007; Aubry et al. 2008). The condition exists in three clinical forms: pre-cervical, intra-cervical and post-cervical (vaginal) torsion (Erteld et al. 2012). Most commonly, the torsion extends caudally beyond the cervix, such that the vaginal wall is involved in the rotation. Torsions to the left occur more frequently than to the right. (Aubry et al. 2008; Erteld et al. 2012). Most of the torsions are counterclockwise and uterus rolls toward and over the non-gravid horn (Drost 2007; Aubry et al. 2008). The degree of uterine torsion varies from 90° to 360°, however 180° to 270° occurs generally (Drost 2007; Aubry et al. 2008). A rotation of 720 degrees in the cow at 161 days of gestation was also reported (Ruegg 1988).

Torsions of less than 45° probably do not cause dystocia (Aubry et al. 2008). The main symptoms in clinical examination are anorexia, rumen stasis, constipation and increased pulse and respiratory rate. There is the evidence of abdominal pain and discomfort. In a transrectal palpation, the orientation of the broad ligaments is distinctly altered; depending on whether the torsion is to the left or the right, the respective broad ligament is pulled tightly cross the uterus. Spiral folds can be palpated per vaginam (Drost 2007).

In cows several methods can be used to correct a uterine torsion and are well described in the obstetric literature: manual detorsion or rotation of the foetus and uterus per vagina, rolling the cow, use of a detorsion rod and caesarean section (Aubry et al. 2008). Treatment depends on the degree of the torsion (Drost 2007). An epidural anesthesia may be helpful.

Manual detorsion per vaginam. Degree of torsion and the amount of cervical dilatation are critical factors for the success of this method. It is frequently used when rotation is about 90° or less. In those cases the foetus can be manually rocked into normal dorso-sacral position (Drost 2007). Some authors mention that manual correction of the torsion is impossible when the torsion does not involve the cervix (Aubry et al. 2008).

Use of detorsion rod. Some practitioners use special tool for the reposition of twisted uterus either as the first choice or after the other method failed. It is a meter long rod with a bar handle for applying torque. At the other end is a double prong with an eyelet at the end of each prong (like a Caemmerer's fork). Each of the two presenting limbs is fixed to one of the prongs by rope or chain. The other variety of the instrument has a loop at one end through which a soft rope can be threaded. The resulting loop is attached to the foetal extremities. A Kuenhs crutch may be used as well (Purohit et al. 2011). Then the foetus can be rotated along its long axis by rotating the handle. Such attempts were successful in 6 / 7 cases (Aubry et al. 2008).

Rolling the cow. Rolling is useful usually in torsion higher than 90° of rotation. The cow is cast with ropes to lie on the side of the direction of the torsion. A long plank is placed in the paralumbar fossa of the cow and an adult person stands on the plank above the paralumbar fossa. Next the front legs of the cow are tied together as the hind legs, and they are pulled up and over the recumbent cow (Drost 2007). Thus the cow is rolled in the same direction as the uterus is twisted. Some cows should be rolled more than once before the torsion is corrected and according to some authors, rolling should be attempted 4 or 5 times before failure is admitted and another technique is tried (Aubry et al. 2008).

Caesarean section. In those cases when none of previous methods are useful or they were applied ineffectively a caesarean section should be performed. Of the 164 recorded bovine uterine torsions 35% of the cases were treated immediately by caesarean section, another 7% after failed detorsion attempts and 20% due to failure of the cervix to dilate following successful correction of the torsion (Frazer et al. 1996). Sporadically, following severe uterine lesions ovariohysterectomy can be performed. Two out of four cows survived and lactated after uterus resection (Schönfelder and Sobiraj 2006).

SMALL RUMINANTS

Uterine torsion in small ruminants is reported not as widely as in cattle possibly, at least in part, because there is less veterinary involvement with obstetric aid and breeders do not discern and document all the cases. In advanced pregnancy colic signs are observed. It also causes dystocia but the incidence is scarce, not exceeding 5% of total dystocia's in sheep and 2% in goats (Sobiraj 1994; Ali 2011). After the first signs of impending parturition the labour discontinues or inoperative contractions occur. Vaginal examination may be difficult, thus the condition can be confused with incomplete cervical dilatation. Post-cervical uterine torsion can be diagnosed through vaginal inspection by spiral twisting of the vaginal wall and difficulties in reaching the cervix, whereas pre-cervical one is diagnosable after laparotomy (Ali 2011). Ultrasound imaging is helpful in some cases (Scott 2011). As the complication of the uterine torsion a blood vessel rupture was described (Blanchard 1981). Exceptionally only, when the degree of twisting is small, the treatment by rotating the foetus per vaginam can be curative. Rolling the dam is the other possible treatment. If ineffective, a surgical detorsion or caesarean section is recommended (Ijaz and Talafha 1999).

MARES

The incidence of uterine torsion is more frequent in first parity mares and the majority of cases occur either in advanced stage of gestation or with completed gestation period. It constitutes 5 to 10% of all serious obstetric problems in horses (Martens et al. 2008). No age predilection was reported for uterine torsion in this species. (Saini et al. 2013). The degree of uterine torsion in mares is ranging from 180° to 540° but there were reported cases of even higher degree (Saini et al. 2013). It has been observed that mares that developed uterine torsion more than 320 days of gestation were less likely to survive (65%) as compared with mares in which uterine torsion occurred before 10 months of gestation (97%). Survival for both mare and foetus is reported to be poor when torsion occurs closer to term and the duration of torsion is longer (Chaney et al. 2007; Saini et al. 2013).

Mares suffering from uterine torsion exhibit signs of colic, and the condition occurs most commonly in the advanced stage of gestation (Martens et al. 2008; Saini et al. 2013). Because signs may be intermittent and the majority of mares respond to non-steroidal anti-inflammatory drugs, a veterinarian may not be asked to examine a mare until the third or fourth colic episode (LeBlanc 2008). Diagnosis is made on rectal palpation of the broad ligaments: one broad ligament is stretched horizontally across the top of the uterus and courses ventrally and laterally across the midline. The broad ligament on the side of the torsion tends to be more caudal and is palpable as a tight vertical band that disappears under the uterus (LeBlanc 2008). To diagnose uterine torsion, it is necessary to combine the findings of rectal palpation, trans abdominal ultrasonography and vaginal examination (López and Carmona 2010). It is not always possible to correctly diagnose the direction of the torsion when performing a rectal examination. If there is a doubt, the torsion should be only corrected by a surgical approach (LeBlanc 2008). Gastrointestinal disorders are frequently encountered in mares suffering from uterine torsion (Jung et al. 2008).

Techniques such as manual rotation through cervix, rolling, standing flank laparotomy and ventral midline celiotomy have been reported for managing uterine torsion in mares. Prognosis for survival of mares and foals after uterine torsion varies greatly from 60% to 70% and 30% to 70%, respectively (Saini et al. 2013) and depends on several factors: vascular involvement, direction and degree of torsion, ischemia of the uterus, adhesions of the gravid uterus and gestation period (Chaney et al. 2007; Jung et al. 2008).

Manual detorsion. Manual rotation of the uterus through the cervix was advocated and it was opined that manual detorsion of uterus containing dead foetus was difficult and involved more risk of uterine lesions (Saini et al. 2013).

Rolling. Rolling should be reserved for mares early in the third trimester, because mares that are rolled close to term are at increased risk for uterine rupture. An additional concern is that if correction of the torsion by rolling is unsuccessful a subsequent standing correction of the torsion is unwise because of the delay associated with recovery from the general anesthesia. If the direction of the torsion is misdiagnosed, rolling the mare may make the condition worse (LeBlanc 2008).

Flank approach. Most uterine torsions in mid gestation can be corrected surgically by a flank approach. Advantages of standing flank surgery for correcting uterine torsions include decreased cost, the ability to inspect portions of the uterus, use gravity and the weight of the

foetus to correct the torsion. Standing laparotomy may be undesirable for intractable mares, females that have uterine tears or mares in late gestation. In the standing flank approach a grid incision is made on the side as the direction of the torsion. The skin and the subcutaneous tissue are incised in vertical direction, while the external, the internal and the transverse abdominal muscle are divided in the direction of their fibres. The veterinarian places his or her forearm under the uterus and rocks the foetus and uterus back and forth to gain momentum. By lifting the uterus and rotating it, the torsion can be corrected (LeBlanc 2008). Sometimes an additional incision in the opposite flank is necessary as well as the assistance of another person's to correct the torsion. The survival rate of foetuses older than 320 days is significantly higher when the uterine torsion is corrected by a standing flank laparotomy compared to a ventral midline approach (Martens et al. 2008).

Ventral midline approach. A ventral midline laparotomy offers the greatest exposure of the uterus and is the method of choice in mares with gastrointestinal involvement, uterine tears, or devitalized tissue and in mares in late gestation. Intraoperative hypoxia must be avoided if the foetus is alive (LeBlanc 2008). In one study 15 from among 19 mares operated between 5 and 11 months of gestation survived and 13 of them (86.6%) gave birth to viable foals at full term (Jung et al. 2008). Ovariohysterectomy may be indicated in chronic cases as described by Doyle et al. (2002) in two mares with good result.

DOGS AND CATS

The etiology of uterine torsion is unknown. One or both uterine horns can simultaneously twist clockwise or counterclockwise from along the longitudinal axis or around the opposite horn (Seyrek-Intas et al. 2011). Most often only one horn torsion occurs. Previous reports have involved torsions ranging from 180° to 2160° perpendicular to its long axis (Seyrek-Intas et al. 2011). Less severe clinical signs are associated with lesser degree of torsion (Root Koostritz 2006). The pregnancy seems to be the main factor contributing to this pathology, because it was described mainly in pregnant females (Misumi et al. 2000). Uterine torsions are observed most often in the second half of pregnancy (Root Koostritz 2006; Thilagar et al. 2005). However, a few cases have been reported in non-pregnant females where pyo-, muco- or hematometra were described (Misumi et al. 2000; De La Puerta et al. 2008, Stanley and Pacchiana 2008; Barrand 2009). Recently the case of unilateral uterine horn torsion in conjunction with bilateral segmental aplasia of the uterine horn in a bitch was presented (Nakamura et al. 2012). It is assumed that the main factors involved to this pathology are excessive foetal movement, premature uterine contractions in late pregnancy, rough handling during pregnancy, lack of tone in the pregnant uterus, lack of foetal fluids, partial abortion, previous stretching of the broad ligament in multiparous individuals, hereditary weakness or variations in length and mobility of a proper ovarian and uterine ligaments and a use of oxytocin (Biller and Haibel 1987; Kumru et al. 2011).

Torsion of one or both uterine horns occurs rarely in queens, but the onset most frequently occurs in the latter half of pregnancy, from the fifth week to parturition. (Root Koostritz 2006). Although two cases of non-pregnant female cats have been described, where pyo- and hematometra were diagnosed (De La Puerta et al. 2008; Stanley and Pacchiana 2008). Unilateral torsion is more common, occurring in 93% of cases. The degree

of torsion can vary from 180° to 900° and less severe clinical signs are associated with a lesser degree of torsion (Freeman 1988; Root Kustritz 2006). More often a left uterine horn torsion occurs (Homer et al. 1980; McIntire and Waugh 1981; Biller and Haibel 1987).

The literature suggests that in cats, a successful outcome not only depends on the degree of uterine torsion but also on effective pre- and postoperative medical supportive therapy and prompt surgical intervention. (De La Puerta et al. 2008).

Uterine torsion in dogs occurs mainly in mid- to late gestation. The degree of the torsion amounts from 180° to 2160° (Seyrek-Intas et al. 2011). Unilateral torsion is more likely to occur than bilateral. Suggested causes of uterine torsion include jumping, running or rolling behavior during excessive play. Reported cases are commonly associated with abnormal uterine distension such as hematometra (Kumru et al. 2011).

The severity of symptoms depends on the degree of the torsion (Root Koostritz 2006). However, external signs cannot be differentiated on the basis of the stage of pregnancy. Uterine torsions in 35-day and 55-day pregnancies displayed the same mild symptoms as in other case of 2 weeks after parturition, while full-term pregnancy showed very severe symptoms (Young et al. 1991; Ridyard et al. 2000; Thilagar et al. 2005; Kumru et al. 2011).

Anamnesis reveals signs of weakness, ataxia, reduction in appetite, dullness, polydipsia, vomiting and a vaginal discharge. In the general examination female can show depression, pale mucous membranes, hypo- or hypertermia, dehydration, tachycardia, poor quality of femoral pulse and cold extremities. Thorough examination reveals mucoid, serosanguineous or haemorrhagic vaginal discharge, distended abdomen and a palpable fluid-filled or firm mass in the upper mid-abdomen. Blood examination generally shows anemia, leucocytosis, neutrophilia, left-shift and thrombocytopenia. Serum biochemical abnormalities include elevation in alanine transferase (ALT), urea and creatinine. Usually there is also a hyperphosphatemia, hyperkalaemia, hyponatremia and hypoproteinemia with elevated activated partial thromboplastin time (APTT). In one study a metabolic acidosis was noted (Stanley and Pacchiana 2008).

Radiographs usually show an enlarged fluid-filled uterus or foetal skeletons. Radiographic signs of foetal death may be seen if near term. These include loss of normal foetal posture, collapse or overlapping of the skull bones, and the presence of intrauterine gas or gas in the foetus. The acute nature of this emergency may not allow sufficient time for these radiographic signs of foetal death to be manifested (Biddle and Macintire 2000).

The ultrasound examination reveals gravid (with dead foetuses, although there can be both dead and live foetuses present) or non-gravid uterus (with fluid filled uterine horns). Ascites also can be present. Diagnosis can be enhanced by color flow Doppler ultrasonography or by exploratory laparotomy. The latter option often is chosen because surgery is the preferred treatment (Root Kustritz 2006).

Torsion of the uterus has been described as an acute, rapidly deteriorating, life-threatening abdominal condition (Misumi et al. 2000; Ridyard et al. 2000). It is important to start the treatment as soon as possible. The decision about the method of surgery treatment should be based on the owner's plans for reproduction. As potential complication of canine uterine torsion a delayed urethral obstruction was described (Reynolds and Campbell 2011).

Ovariohysterectomy. This method is recommended in cases where the owner is not planning to mate the female in the future. The advantage of this treatment is that it's preventing the patient from subsequent uterine torsion, endometritis-pyometra complex and other reproduction-based diseases. Although this procedure is terminating animal's reproductive ability.

Unilateral ovariocornuectomy. When the female is designed for breeding a unilateral ovariocornuectomy should be considered. This procedure was not recommended as the treatment in the past because of fear of uterine rupture following torsion and a potential luteal deficiency at the course of pregnancy in the future. However recent studies on dogs, horses, pigs and rabbits showed that none of that complications occurred. The possibility of achieving pregnancy after unilateral cornuectomy has been evaluated (Santschi and Slone 1994; Günzel-Apel et al. 2008; Seyrek-Intas et al. 2011; Kumru et al. 2011; Ozalp et al. 2012). This procedure keeps animal's reproductive ability. The disadvantage of this method is the possibility of future uterine torsion.

Initially only one uterine horn was being removed without ipsilateral ovary because of fear of the progesterone deficiency (Santschi and Slone 1994; Seyrek-Intas et al. 2004). However, further studies revealed that progesterone concentration after removal of one ovary is sufficient to physiological course of estrous cycles and pregnancies (Kumru et al. 2011; Seyrek-Intas et al. 2011; Ozalp et al. 2012). According to the literature unilateral ovariocornuectomy causes a reduction in litter size. (Seyrek-Intas et al. 2011; Kumru et al. 2011). Ovariohysterectomy and unilateral ovariocornuectomy should be carried out without correction of the torsion. So far there have been no studies about treating uterine torsions in cats by unilateral ovariocornuectomy.

The release of endotoxins and inflammatory mediators into the systemic circulation as the result of the torsion may lead to further compromise of vital organs. In cases when the torsion was corrected intraoperatively, an unsuccessful outcome was reported (Pankhurst and Newman 1961; Young and Hiscock 1963; Ridyard et al. 2000). Despite the surgery a supportive treatment is recommended depending on patient's clinical condition. Available literature reports following treatment: IV fluids therapy (crystalloids, e.g. sodium chloride, glucose, dextrose), blood transfusion if needed and a broad spectrum antibiotic therapy (cefazolin, cephalexin, amoxicillin-clavulanate, cefuroxime, enrofloxacin, ampicillin) (Ridyard et al. 2000; Thilagar et al. 2005; De La Puerta et al. 2008; Stanley and Pacchiana 2008). In cited cases the treatment was successful and uneventful outcome was achieved.

CONCLUSIONS

Uterine torsion is an acute, life threatening disease that requires prompt help. It was described many years ago. Although etiology of this condition is still not well known. Diagnosis when made at the basis of good interview, clinical examination and a couple of additional trials seems to be quite simple. Not much has changed in the approach to the treatment for uterine torsion in cows, small ruminants and horses but there are some new techniques in small animals.

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Abstract. Uterine torsion is a non-common problem in almost all domestic animals other than cattle. It occurs mainly in the second half of pregnancy or at parturition as a cause of dystocia. Torsion is described as twisting of the uterus perpendicular to its long axis. The etiology of this condition is still not well known but it seems that instability of the gravid uterus is a possible risk factor. External signs are nonspecific. The condition is diagnosed by vaginal inspection, rectal palpation and abdominal imaging. In farm animals the treatment is aimed at the saving of the uterus and to this reason, non-surgical methods are mainly preferred. They include manual detorsion *per vaginam*, use of detorsion rod and rolling the animal along its longitudinal axis. If ineffective, surgical methods are applied. Conversely, in dogs and cats surgical methods are the treatment of choice. Until recently the total ovariohysterectomy was preferred which was terminating animals' reproductive ability. Now new technique, unilateral ovariohysterectomy – ovariocornuectomy is being used as well.

