Case Report

Removal by laparoscopic partial ovariohysterectomy of a uterine leiomyoma assumed to have caused fetal death in a mare

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Summary

A 13-year-old pluriparous Dutch Warmblood mare presented to Utrecht University’s Department of Equine Sciences 4 weeks after suspected abortion at 3.5 months gestation, to investigate the nature of a uterine mass and persistent vulval discharge. Transrectal ultrasonographic examination revealed copious flocculent fluid and fetal remnants within the uterus and a 5–6 cm heterogenous mass in the uterine wall at the tip of the right horn. Expulsion of fetal parts and resolution of the coexisting endometritis were effected by a combination of repeated PGF$_2\alpha$ analogue injections to induce oestrus, application of PGE$_2$ gel to aid cervical relaxation, and daily uterine lavage and antibiotic instillation. The presence of the mass in the uterine wall was confirmed by hysteroscopy and the suspected tumour subsequently removed by partial laparoscopic ovariohysterectomy under standing sedation and local anaesthesia. The histological appearance of the tumour was consistent with a leiomyoma or moderately malignant leiomyosarcoma. Although a follow-up examination 6 months post surgery revealed uncomplicated healing of the uterus, the owner decided to retire the mare from breeding.

Introduction

Uterine neoplasia is uncommon in the mare, but when uterine tumours do occur they are most commonly leiomyomas (Hoffsis et al. 1986; Santschi and Slone 1994; McCue 1998; Berezowskie 2002; MacLachlan and Kennedy 2002; Hinojosa et al. 2003; Brandstetter et al. 2005; Quinn and Woodford 2005). Other types of uterine tumours have been reported only rarely, but include leiomyosarcomas, rhabdomyosarcomas, lymphosarcomas and (aden-o-) carcinomas (Gunson et al. 1980; Torbeck et al. 1980; McEntee 1990; Kennedy and Miller 1993; McCue 1998; MacLachlan and Kennedy 2002). Small uterine leiomyomas are often clinically symptomless and discovered as an incidental finding during a routine fertility examination, whereas larger leiomyomas are commonly associated with clinical problems such as prolonged infertility, abdominal pain, protrusion of tumour tissue through the vulva, persistent uterine haemorrhage and secondary endometritis (Hoffsis et al. 1986; Broome et al. 1992; Santschi et al. 1995; McCue 1998; Hollerieder and Tóth 2002; Janicek et al. 2004; Brandstetter et al. 2005; Frazer 2005; Quinn and Woodford 2005).

Surgical removal of a uterine leiomyoma is indicated when the tumour is large, associated with clinical problems, or when the mare is intended for breeding (McCue 1998). A number of surgical approaches and techniques have been described (Hoffsis et al. 1986; LeBlanc 1991; Hooper et al. 1992; Bliskager et al. 1993; Hollerieder and Tóth 2002; Bartmann et al. 2003; Hinojosa et al. 2003; Quinn and Woodford 2005). In the case of large or invasive tumours, complete or partial ovariohysterectomy (OVHX) is generally indicated (McCue 1998) and, until relatively recently, this was usually performed via a ventral midline or paramedian approach in the anaesthetised horse (Romagnoli et al. 1987; Broome et al. 1992; Santschi and Slone 1994; Santschi et al. 1995; Berezowskie 2002; Rötting et al. 2003; Brandstetter et al. 2005). A flank approach in the standing sedated mare was recently suggested for partial OVHX, and may be
preferable because it avoids the risks of general anaesthesia (Hinojosa et al. 2003; Janicek et al. 2004). However, while Janicek et al. (2004) and Muurlink et al. (2008) described partial OVHX using a hand-assisted laparoscopic technique, there are currently no reports of partial OVHX in the mare by laparoscopy alone.

Retention and maceration of the fetus within the uterus following fetal death is uncommon in the mare, but when it does occur symptoms are usually restricted to vaginal discharge without systemic complications (Vénezia et al. 1975; Kennedy and Miller 1993; Lofstedt 1993; Santschi et al. 1995; Barber and Troedsson 1996; Burns and Card 1998). This Case Report describes fetal retention and maceration coexistent with a moderately sized uterine leiomyoma in a mare, together with the approaches to resolve the resultant endometritis and to remove the tumour.

Case history

A 13-year-old pluriparous Dutch Warmblood mare was presented at Utrecht University’s Department of Equine Sciences approximately one month after suspected abortion, for further investigation of a uterine mass and persistent vaginal discharge. The mare’s previous breeding history was unremarkable and included the production of 3 live foals, the last of which had been born 3 years previously, and no previous indications of reproductive problems or uterine abnormalities. Four and a half months prior to referral to the university clinic, the mare had conceived after a single insemination. Abortion and fetal expulsion were presumed to have occurred at 3.5 months of pregnancy when the owner reported a vaginal discharge accompanied by protrusion of fetal membranes from the vulva. The referring veterinarian diagnosed abortion either caused by, or resulting in, endometritis after detecting copious fluid in the uterus during an ultrasonographic examination. A uterine swab yielded heavy growths of *Streptococcus* spp. and *Staphylococcus* spp. and initial treatment consisted of a single administration of a prostaglandin F$_2\alpha$ analogue to induce oestrus, followed by intrauterine antibiotic administration to resolve the endometritis. At a follow-up examination 2 weeks after initial treatment, the mare still had a sanguineo-purulent vaginal discharge, and a firm mass was palpated in the tip of the right uterine horn. At this point, the mare was referred to the university clinic.

Clinical findings

At admission, the mare was in good general health and body condition, and all vital parameters were within normal limits. Per rectum palpation and ultrasonography of the reproductive tract, using an ultrasound machine equipped with a 7.5 mHz probe (MyLab30Vet)$^1$, revealed a large haemorrhagic follicle or corpus luteum (CL) on the right ovary. The cervix was firm and closed and the uterus was large, flaccid, oedematous and contained large quantities of echogenic fluid within which fetal remnants/bones were visible (Fig 1). A uterine mass of approximately 5–6 cm in diameter was located at the tip of the uterine horn; the mass was solid with a heterogeneous, well-vascularised appearance (Fig 2).

Treatment

A cuffed uterine flushing catheter$^2$ with an internal diameter of 8 mm was passed through the cervix and a sample of fluid was collected for microbiological examination before the uterus was flushed with 3 l lactated Ringer’s solution$^3$. Because it was suspected that the mare still had active endometrial cups, oestrus, cervical softening and uterine emptying were stimulated by daily administration of the prostaglandin-F$_2\alpha$ analogue cloprostenol (375 µg Estrumate)$^4$ for 3 days. Uterine lavage with 3 l lactated Ringer’s solution was performed daily for a further 5 days, and on Days 3–5 post admission lavage was followed by intrauterine infusion of 15 ml 5% gentamycin (Gentamycine 5%)$^5$ because microbiology revealed a heavy growth of *Pseudomonas aeruginosa* and a light growth of *Escherichia coli*, both of which were sensitive to gentamycin.

On Day 4 post admission, a 0.5 mg PGE$_2$ tablet (dinoprostone: Prostin E$_2$)$^6$ was introduced into the cervical canal to aid relaxation 30 min prior to uterine lavage; only a few fetal remnants were recovered in this flush, and none were visible ultrasonographically following lavage. After completing the 3 day course of intrauterine gentamycin, flushing was discontinued and replaced by twice daily administration of oxytocin (Oxytocin)$^7$ for 2 days, after which uterine fluid accumulation was negligible and treatment was stopped. Ten days later,

![Fig 1: Uterine ultrasonograph showing large quantities of echogenic fluid within which fetal remnants are clearly visible.](image-url)
when the mare was again in dioestrus, hysteroscopy was performed using a videodoscope with a working length of 180 cm (Pentax EC3800F)\(^6\). Both utero-tubal junctions were readily accessed, the bulk of the endometrium appeared normal and a ring of endometrial cups was present at the base of the right uterine horn. Approximately halfway along its length, the right horn appeared to be constricted and ventromedial to the utero-tubal papilla the tip of the horn was pushed into the lumen by a solid mass (Fig 3). Although the endometrium over the mass was intact, it was unusually pale despite the presence of many more superficial blood vessels than normal. Based on the ultrasonographic and endoscopic findings, a presumptive diagnosis of a uterine tumour was made, and partial OVHIX recommended.

Prior to laparoscopic surgery, the mare was starved for 2 days. Perioperative antibiotic therapy was provided in the form of i.v. ampicillin sodium (10 mg/kg bwt; Ampi-dry 5000)\(^9\) and gentamycin (6.6 mg/kg bwt; Gentamycine 5%)\(^5\) administered 10 min before sedation. Standing sedation was initiated using i.v. boluses of detomidine hydrochloride (10 µg/kg bwt; Domosedan)\(^6\) and buprenorphine (6 µg/kg bwt; Temgesic)\(^4\) and subsequently maintained by continuous i.v. infusion of detomidine (0.1 µg/kg bwt/min) in Ringer’s solution, as described by van Dijk et al. (2002). The mare’s right flank was then prepared for aseptic surgery and the skin and muscles at the sites for laparoscopic instrument introduction were infiltrated with 2% lidocaine hydrochloride plus adrenalin injected via a laparoscopic needle. Both structures were then transected using a combined laparoscopic scalpel and electrocautery device (Ligasure: Cavion)\(^12\) introduced via the dorsal portal while the uterus and ovary were stabilised and manipulated using a small grasping forceps (5 mm)\(^11\) inserted through the ventral portal. The uterine horn was then circumferentially ligated twice, approximately 4 cm distal to the tumour, with 5 metric vicryl\(^13\) secured with

![Image](https://via.placeholder.com/150)

**Fig 2**: Ultrasonographs of the 5–6 cm uterine mass located in the tip of the right horn; the mass had a heterogenous (a), well-vascularised (b) appearance.

Fig 3: Hysteroscopy: approximately halfway along its length the right horn appeared to be constricted and ventromedial to the utero-tubal papilla the tip of the horn was pushed into the lumen by a solid mass.
extracorporeal Roeder’s knots (Rijkenhuizen 1999). The horn was dissected between the 2 ligatures, which were left in place. The cranial part of the uterine horn, including the mass, was resected using laparoscopic scissors, after which the resected ovary and the cranial part of the uterine horn were positioned in the right caudoventral part of the abdominal cavity with a grasping forceps through the ventral instrument portal. A third instrument portal (5 mm cannula) was made between the other 2 for the needle holder [HIQ Needle Holder 5 mm] and the uterine stump was then closed using 3.5 metric vicryl in a single layer of interrupted Lembert’s sutures (nonperforating), knotted extracorporally [Roeder’s knot].

After inspecting the surgical sites for haemorrhage, a small (approximately 9 cm) laparotomy was created by incising the skin between 2 of the portals in the flank and bluntly dissecting the underlying muscles and peritoneum. Extraction of the excised ovary and portion of uterus was facilitated by introducing a disposable surgical drape (OP Cover, 120 x 120 cm) through the laparotomy wound and passing it around the excised tissue, starting ventrally, under laparoscopic vision and with the help of a laparoscopic Babcock (10 mm), as previously described by Rambags et al. (2003). Once the tissue was enclosed, the introduced end of the drape was exteriorised via the laparotomy wound such that the enclosed ovary and uterine mass could be removed simply by pulling on and removing the drape. The laparotomy wound was closed routinely; the transverse and oblique abdominal muscles were sutured independently with simple interrupted sutures (1 vicryl), the subcutaneous tissue was closed using 2-0 monocril in a simple continuous pattern and, finally, the skin was closed using a continuous intradermal suture with 2-0 monocril. One single interrupted suture in the skin (2-0 monocril) was used to close the remaining instrument portal. The uterine mass was submitted for histological examination.

Post operative antibiosis and pain relief were provided for 3 days in the forms of once daily procaine penicillin (20,000 iu/kg bwt i.m.; Depocillin) and gentamycin (6.6 mg/kg bwt i.v.) and twice daily flunixin meglumine (1.1 mg/kg bwt i.v.: Bedozane), respectively. The mare was not unusually painful post operatively (mild discomfort for 24-48 h post surgery is fairly routine following laparoscopic ovariectomy) and made an uncomplicated recovery. She was discharged 7 days after the operation.

Pathology

Macroscopic examination of the suspected tumour confirmed a well-delineated 6–8 cm fibrous mass within the myometrium (Fig 4); this was classified histologically as a leiomyoma or leiomyosarcoma of low-grade malignancy.

Follow-up

Re-examination of the mare’s reproductive tract 6 months after surgery revealed that the uterine horn had healed well without adhering to other abdominal organs. A small amount of fluid was ultrasonographically visible within the uterine lumen, and hysteroscopic examination demonstrated that the inverted stump of the right uterine horn had healed well with the exception of a few small areas (3–5 mm) of granulation tissue lacking epithelium (Fig 5). Cytological examination of the uterine fluid revealed epithelial but no inflammatory cells and the sample was, therefore, not submitted for bacteriological culture. Despite the healthy overall picture, the owner decided to retire the mare from breeding and restrict future use to recreational riding.

Discussion

It is suspected that the uterine leiomyoma was the initiating cause of fetal death in the current case. However, this could not be proven definitively and neither was it clear how the tumour may have initiated fetal death. In this respect, there were no signs of endometrial haemorrhage or necrosis (Hollrieder and Tóth 2002; Brandstetter et al. 2005) and it is likely that the endometritis

Fig 4: Macroscopic appearance of the excised uterine mass classified histologically as a leiomyoma or leiomyosarcoma of low-grade malignancy.

Fig 5: Hysteroscopy 6 months after surgery: the inverted stump of the right uterine horn had healed well with the exception of a few areas (3-5 mm) of granulation tissue lacking epithelium (black arrows).
encountered at presentation was secondary to fetal maceration rather than the presence of the tumour. Indeed, following removal of the fetal remnants, the endometritis was rapidly resolved and did not recur. On the other hand, it is possible that the abnormal endometrium in the tip of the right uterine horn played a role in fetal death; this might explain the timing of fetal death at around Day 100 of gestation since the allantochorion would have started to interdigitate with the endometrium in the horn tips from around Day 80–85 (Allen and Stewart 2001). It is, of course, also possible that the leiomyoma was an incidental finding and that fetal death was due to some other cause. Failure to expel the fetus fully following fetal death was probably a factor of inadequate cervical dilation (Burns and Card 1998), because of equine chorionic gonadotrophin (eCG) produced by the endometrial cups prevented circulating progesterone concentrations dropping low enough for long enough to allow cervical relaxation.

The theoretical advantages of a laparoscopic approach to partial OVHX include avoidance of general anaesthesia, better visualisation of the uterine horn and ovary, better assessment of haemostasis, minimal intra-abdominal contact and traction on mesovarium and mesometrium, a reduced risk of contamination and an abbreviated convalescence (Gottschalk and van den Berg 1997; Walmsley 1999; Rijkenhuizen and van Dijk 2002; Rambags et al. 2003; Smith et al. 2005; Hendrickson 2006). Disadvantages include the cost of the equipment and the need for surgical experience (Rijkenhuizen and van Dijk 2002). While the potential complications include failure of ligatures, haemorrhage or infection of the mesovarial or uterine stumps, recumbency during the operation and accidental perforation of other abdominal organs (Rijkenhuizen and van Dijk 2002; Smith et al. 2005; Hendrickson 2006), the likelihood and severity of complications following partial laparoscopic OVHX are theoretically lower than those described for a conventional approach via a midline laparotomy (Santschi et al. 1995; Rötting et al. 2004) or via an oblique paramedian procedure (Santschi and Stone 1994). Nevertheless, a number of laparoscopic partial hysterectomies need to be performed before it is possible to comment on complication rates.

In the present case, no major complications were encountered and the procedure was well tolerated by the mare. Slight abdominal discomfort and an increase in body temperature were only seen during the first 24 h after surgery. Brief (24–48 h) post laparoscopic discomfort is not unusual and probably relates to a minor chemical peritonitis induced by the introduced carbon dioxide or the intra-abdominal manipulation. The risk of abdominal contamination by uterine contents was minimised by prior treatment of the endometritis, performing surgery during dioestrus and placing ligatures distal to the tumour before incising the uterus. Finally, by enclosing the excised tumour and ovary within a plastic drape intra-abdominally, it was possible to restrict the size of the laparotomy wound and minimise trauma to the surgical wound. The convalescence time was therefore short with the horse returning to light training 6 weeks post operatively.

In theory, mares that have undergone partial OVHX may still be capable of carrying a foal to term. Indeed, Santschi and Stone (1994) reported production of normal foals by 2 mares from which up to 50% of a horn had previously been removed. The precise amount of uterine tissue that can be removed without significantly compromising fetal nutrition is, however, unknown and depends not only on the amount of tissue removed but also on the quality of the remaining endometrium (Lofstedt 1993). In the current case, examination 6 months post operatively revealed no reasons for precluding breeding (no adhesions to other abdominal organs, complete closure of the uterine wound and removal of only 30% of one uterine horn). However, because it was impossible to guarantee that the uterus could support a pregnancy to term, and the mare was not valuable enough to consider using embryo transfer, the owner decided to retire the mare from breeding.

References


