Successful pregnancies in a mare after laparoscopic unilateral ovariohysterectomy

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Abstract

A 6 year old Thoroughbred mare was presented for investigation of infertility. Over 3 consecutive seasons, she had been bred naturally (14 controlled estrous cycles) with 3 Thoroughbred stallions and did not become pregnant. The mare was bred artificially over 3 estrous cycles with semen from a Quarter horse stallion (known for excellent fertility). Both ovaries appeared functional. During embryo collection on day 7 postovulation, failure of appropriate dilation of left uterine horn was noticed after embryo collecting medium was infused. Diagnostic hysteroscopy was performed and partial patency defect of the left uterine horn was identified. After sedation and local anesthesia, a unilateral laparoscopic ovariohysterectomy was performed while the mare was standing. Approximately 80% of the left uterine horn was removed using a vasculature sealing device to provide hemostasis and intracorporeal suturing technique was used for uterine closure. Subsequently, the mare became pregnant and foaled twice.

Keywords: Mare, infertility, uterus, hysteroscopy, laparoscopy, unilateral ovariohysterectomy

Background

Successful pregnancy and birth of a healthy foal are possible in mares with only 1 functional uterine horn.[1] However, infertility may become an issue in such cases, depending on the physiological capability of the remaining functional uterine horn. Furthermore, inability of the embryo to move between uterine horns can cause failure of maternal recognition.[2] In certain cases, it is not the absence of a uterine horn, but rather limited function of a uterine horn that may cause infertility. These cases, not only complicate infertility diagnosis but also may be difficult to solve. We used hysteroscopy to diagnose a uterine patency defect of a uterine horn that had been the cause of infertility and applied laparoscopic hysterectomy technique to correct this problem.

Case presentation

History

A 6 year old maiden Thoroughbred mare was presented for investigation of infertility. The mare failed to become pregnant over 3 consecutive breeding seasons. During this time, she had been bred naturally (3 Thoroughbred stallions over 14 managed estrous cycles). Her endometrial score was IIA (mild lymphocytic endometrium). Oral treatment with altrenogest (Regumate® Merck Animal Health, Madison, NJ) was implemented once during her first breeding season (0.088 mg/kg), starting on day 5 postovulation. During second and third breeding seasons, PGE_2 gel (Prostin E_2 vaginal gel, Pfizer, New York, NY) was laparoscopically applied to uterine tubes for suspected uterine tube obstruction as a cause of infertility. During first laparoscopic procedure, both uterine tubes appeared dilated. Mare was bred naturally in 3 estrous cycles (twice with 1 of the initial stallions and with a new stallion on the third cycle) with no resultant pregnancy. A year later, a second laparoscopic procedure was performed. The left uterine tube appeared dilated at its cranial half and there was an obvious area of scarring and constriction in the middle of the uterine tube. Visible bands constricting the uterine tube were transected, in addition to PGE_2 gel application.[3] The right uterine tube appeared normal as observed during initial laparoscopy and PGE_2 gel application was repeated.

Clinical Examination

Late in the third breeding season, the mare was presented for assessment and was in good physical condition. Initial examination (transrectal palpation and ultrasonography) identified 2 functioning ovaries, with follicular activity on both ovaries and evidence of a recent ovulation (corpus hemorrhagicum) on the left ovary. A low volume uterine lavage was performed and a clitoral swab was submitted for culture and sensitivity. Intrauterine treatment was initiated for 3 consecutive days with ceftiofur (1 g, Accent®, Zamira, Australia) for *Escherichia coli* and β haemolytic *Streptococcus spp* (group C). A controlled (for embryo collection on day 7 postovulation) breeding cycle was

conducted. The mare was inseminated with fresh semen (> 500 x 10^6 progressively motile sperm) from a Quarter Horse stallion (history of 100% first cycle conception rates that breeding season). Breeding was 1 day before ovulation, based on transrectal ultrasonography findings (Table).

Table. Ovulation, artificial insemination, embryo recovery details, and pregnancy details

Ovary ovulated	Date of insemination	Date of ovulation	Embryo recovery/pregnancy
Left	March 14/15	March 16	Negative
Right	April 4	April 5	Positive 7 days
Right and left	May 14/15	May 15	Positive 14 days

Embryo collection was attempted on day 7 post ovulation in first 2 estrous cycles. The left uterine horn's inability to dilate appropriately was observed after infusion of embryo collecting medium. In the third estrous cycle, embryo collection was not performed, and mare was diagnosed pregnant on day 14 postovulation. The conceptus was attached to the base of the left uterine horn and grew normally until ~ 25 days. An embryo proper could be visualized at this time; however, heartbeat could not be identified, and conceptus regressed by day 30, despite oral altrenogest (0.044 mg/kg) and 3 g of aspirin (ACE chemical company, Australia) treatments daily, starting day 5 postovulation.

A hysteroscopy was performed using a 1.5 m endoscope with a 9.2 mm diameter to examine the endometrium and determine uterine horn patency. Examination identified a normal right uterine horn and endometrium. However, ~ one-third along the length of the left uterine horn, a blind end appeared, preventing left utero-tubal papillae visualization. Further instillation of air was required, and a small opening appeared, allowing passage of the video endoscope with difficulty. Remainder of the uterine horn appeared normal and the utero-tubal papillae was visible.

Treatment

Removal of the affected uterine segment was recommended, and surgery was scheduled for the nonbreeding season. A unilateral laparoscopic ovariohysterectomy was performed while the mare was standing, using standard flank laparoscopic technique with the mare sedated and restrained in stocks. An indentation in uterine contour was noticed in the left uterine horn, just cranial to uterine body and corresponding to the location identified in hysteroscopic examination. Approximately 80% of the left uterine horn was removed. Ovarian pedicle and broad ligament were desensitized with 50 ml of 2% mepivacaine (Troy laboratories, Australia). A vasculature sealing device (Covidien LigaSure™, LS1037, Medtronic, Minneapolis, MN) was used to transect and seal vasculature of ovarian pedicle and broad ligament to the point of obstruction. It was also used to transect the uterine horn immediately caudal to the uterine obstruction before intracorporal suturing of the uterus, using a double layer of a barbed suture (Covidien V Loc™, VLOCA008L, Medtronic) placed with an Endo Stitch™ (173027, Medtronic). The ovary and uterine horn were removed from the abdomen with the aid of a retrieval bag (Covidien Endo Catch II Specimen Pouch, 15 mm, Medtronic). Surgery time was 52 minutes. The mare was treated orally with phenylbutazone (Bute Paste®, Ranvet, Australia) 1 g, once daily for 5 days.

Outcome

One month later, hysteroscopy was performed, and endometrium appeared to be healing well and the mare was returned to a stud farm for routine breeding management. One week later, a prebreeding examination was performed by the farm veterinarian and transrectal ultrasonography identified a palpable mass with mixed echogenicity at the surgical site on the left uterine horn stump. Serum amyloid A (SAA) concentrations were 2707 µg/ml and white cell count was normal. No other sources of acute inflammation were identified. Treatment was initiated orally with doxycycline (Bova Compounding, Australia) 10 mg/kg twice daily for 3 weeks) because of its oral bioavailability, required duration of treatment, and the antimicrobial susceptibilities in this farm. A reduction in the abscess was noted over time and doxycycline was discontinued based on SAA concentrations (0 µg/ml).

In the subsequent breeding season, the mare failed to conceive and maintain pregnancy following her first breeding attempt. After second unsuccessful breeding of the season, *Klebsiella pneumoniae* infection of the clitoris was identified. Clitoris was treated topically with amikacin sulphate (50 mg/ml) ointment (Bova Compounding) for 3 days. Pregnancy was detected after the third breeding of the season and the mare commenced orally treatment with altrenogest (0.088 mg/kg), following the detection of embryo at 14 days and treatment continued throughout pregnancy. A healthy 50 kg colt was foaled on 363 days of pregnancy and continued to grow and develop normally, similar to his cohort. The mare was subsequently bred again and became pregnant following her first breeding at 34 days postpartum. A healthy 53 kg filly foaled at 359 days gestation.

Discussion

Prior to admission, the mare was bred during 14 estrous cycles (3 consecutive breeding seasons) by 3 stallions. During this period, mare had 5 ovulations from the right ovary and was bred to 1 specific stallion for 4 of these 5 ovulations. Infertility continued, despite attempts to correct the suspected uterine tube blockade via laparoscopy. However, these procedures enabled visualization of scarring and constriction of left uterine tube and allowed transection of the fibrous material that caused constriction. It was not known whether infertility was due to functional inability of the left ovary or a left uterine horn problem. The contribution of the left uterine horn became partially evident in 1 controlled breeding cycle, as the conceptus remained in situ. However, it failed to thrive when attached to the base of the left uterine horn, despite hormonal and anti-inflammatory treatments to support pregnancy.

This case demonstrated the value of hysteroscopy in the identification and diagnosis of uterine disease and abnormalities. A uterine problem that we diagnosed via hysteroscopy had been the cause of this barren maiden mare's 3 year history of infertility. Although the majority of ovulations were from the left ovary, the defect identified in the left uterine horn had contributed to the apparent infertility of this mare, likely due to restricted conceptus mobility and resulted in the failure of maternal recognition of pregnancy.[2] The defect caused complete closure of the left uterine horn; incidentally, a substantial amount of air was required to insufflate the uterus to allow passage of the scope. Furthermore, fluid could not be palpated in the left uterine horn during manual transrectal manipulation of the uterus during embryo retrieval. This defect might have restricted the entry of semen and possibly embryo migration.[2] Although altrenogest supplementation allowed embryo to grow, restriction of embryo mobility might have resulted in pregnancy loss.

Total and partial ovariohysterectomy have been performed to remove uterine tumors[4-7] or to resolve pyometra[8-9] in mares that were unresponsive to medical therapy. In the present case, a partial ovariohysterectomy was used to correct a uterine patency defect. A laparoscopic approach was undertaken to allow standing surgery, reduce patient morbidity, improve visualization of structures, improve hemostasis, and to shorten the convalescent period. Although hand assisted laparoscopic techniques were reported, [5,8,9] exteriorization of uterus was necessary in such cases, rather than performing partial hysterectomy within the abdomen, as described herein. We adopted more advanced laparoscopic skills and equipment to complete the procedure in a relatively short interval.

An enlarged structure identified at the site of uterine closure after hysteroscopy was possibly an abscess due to uterine stump infection.[8] Elevated SAA concentrations suggested this possibility. Hysteroscopy procedure might have damaged the tissue, resulting in a hematoma and abscess formation. Mare was treated with doxycycline, due to concerns of abscess rupture and peritonitis and the enlarged structure resolved in 3 weeks.

Prolonged pregnancies (363 and 359 days) were likely due to physically restricted placental surface area. This restricted placentation resembled Type A twin placentae situation[10] wherein 1 twin occupied uterine body and 1 uterine horn (68% total uterine surface area) or in a case of uterine unicornis.[1] Although ~ 80% of the left uterine horn was removed, the remaining right uterine horn was sufficient in size (noted at the time of hysteroscopy) to support the growth of foal to maturity by providing adequate microscopic area of fetomaternal placental contact.[11] It is important to recognize that foal birth weights (50 and 53 kg) were within normal limits for the mare's age and parity.[12]

Learning points

- Hysteroscopy is a useful tool in the diagnosis of infertility and in the treatment of blocked uterine tubes.
- Partial hysterectomy can be performed efficiently with advanced laparoscopic skills and equipment.
- Birth of a normal foal is possible after partial hysterectomy.

Conflict of interest

None to report

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