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Transendoscopic synechiolysis of extensive intrauterine adhesions by repeated operative hysteroscopy in a mare – a case report

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Summary

Although not unknown, intrauterine adhesions in mares are seldom reported as a cause of infertility. The reason for this might be that routine clinical and ultrasonographical gynaecological examinations do not permit certain diagnosis, which, can only be made by hysteroscopy. Today hysteroscopical procedures can be used to perform minimally invasive intrauterine synechiolysis in horses in addition to diagnostic applications. In this case four hysteroscopic sessions at four-week intervals were required to remove from a mare by high-frequency electrosurgery a total occlusion of the corpus uteri, multiple string-like adhesions, broad transluminal sheets, thicker partial and total septa, and extensive plane adhesions, as well. There were no intra- or postoperative complications such as severe haemorrhage, abdominal pain or perforation of the uterus. A session was ended not only when visual monitoring became impossible due to slight bleeding or loss of adequate uterine distension, but also when it was not possible to distinguish between adhesion and tissue that should not be destroyed. By waiting for demarcation and rejection of the destroyed tissue to occur, it was possible to avoid excessive lacerations or perforation of the uterine wall. The time interval of four weeks between hysteroscopic sessions thus proved to be practicable. In this mare it was possible to restore complete passage of the corpus uteri and the right horn, but the tip of the left horn re-adhered. In the subsequent breeding season the mare became pregnant, but the pregnancy was maintained only up to the fourth month of gestation. The possibilities and limits of available theurapeutic measures are also discussed .

Keywords: horse, mare, operative hysteroscopy, intrauterine adhesions, high-frequency electrosurgery

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Transendoskopische Adhäsiolyse einer ausgedehnten intrauterinen Synechie durch wiederholte operative Hysteroskopie bei einer Stute.

Intrauterine Adhäsionen als Sterilitätsursache beim Pferd sind bekannt, jedoch selten beschrieben. Die Ursache dafür liegt vermutlich darin begründet, dass die eindeutige Diagnose bei den oft klinisch und ultrasonographisch unauffälligen Stuten erst hysteroskopisch gestellt werden kann. Über die Diagnose hinaus existieren heute auch hysteroskopische Methoden zur minimal invasiven Adhäsiolyse. Im vorgestellten Fall wurden bei einer Stute innerhalb von vier Sitzungen im Abstand von jeweils vier Wochen eine vollständige Occlusion im Corpus uteri, sowie cranial davon gelegene ausgedehnte flächige Verklebungen, Spangen und Septen mittels transendoskopischer hochfrequenzchirurgischer thermischer Präparationstechnik entfernt. Intra- oder postoperative Komplikationen, wie Hämorrhagie, Schmerzzustände oder gar Uterusperforation waren nicht auffällig. Gründe für den Abbruch einer Sitzung waren neben Einschränkungen der visuellen Bedingungen durch leichte Blutungen oder durch Verlust an ausreichender Distension, vor allem mangelde Differenzierbarkeit der Verklebung von erhaltenswertem Gewebe. Durch Abwarten der Demarkation des Detritus und Abheilung der Läsionen, konnte eine übermäßige Wundsetzung vermieden werden. Ein Abstand von vier Wochen zwischen den einzelnen Hysteroskopien erwies sich somit als praktikabel. Bei der Stute konnte eine vollständige Passage von Gebärmutterkörper und rechtem Horn erreicht werden, in der linken Hornspitze trat eine erneute Verklebung ein. In der folgenden Saison konzipierte die Stute, blieb jedoch nur bis zum vierten Monat tragend. Therapeutische Möglichkeiten und Grenzen werden diskutiert.

Schlüsselwörter: Reproduktion, Stute, operative Hysteroskopie, intrauterine Adhäsionen, Hochfrequenzchirurgie

Introduction

Depending on the extent of intrauterine adhesions, in the mare they can result in infertility either by limiting the movement of the early conceptus, which is necessary for maintenance of pregnancy, or even by preventing semen transport to the fallopian tubes. Furthermore, uterine clearance can be considerably lowered, which can lead to endometritis.

Nevertheless such mares, usually with a history of infertility over several years, often do not show any clinical signs of genital disease; and ultrasonographic examination brings unclear or no pathological findings at all (*Stone* et al. 1991, *Bracher* et al. 1994, *Bartmann* et al. 2000). The certain detection of intrauterine adhesions in the horse became possible only with the advent of hysteroscopy as a diagnostic tool in equine gynaecology.

Precise and gentle methods for synechiolysis have become available with the development of minimally invasive surgical dissection techniques suitable for hysteroscopical procedures. These include transendoscopic laser surgery and high-frequency electrosurgery, methods which are well established in human medicine for this indication (*Valle* and *Sciarra* 1988, *Wallwiener* et al. 1992). Intrauterine synechiolysis has been

successfully employed in the horse, as well, although there are only a few published reports (*Bracher* et al. 1994, *Allen* et al. 1997, *Bartmann* et al. 2000).

In the present case of synechiolysis in a mare with extended severe intrauterine adhesions, we describe repeated high-frequency electrosurgery as an advantageous preparation technique and point out what appear to be the surgical possibilities and limits of hysteroscopy in the horse.

Case

In April, 2001, a 13-year-old warmblood mare was admitted to the Clinic for Horses, School of Veterinary Medicine Hannover for removal of endometrial cysts. The mare had had two foals with no obvious problems in the parturitions. Since the birth of the second foal four years previously, all attempts to breed this mare had been unsuccessful. There was no known history of intrauterine inflammation or local treatment.

Diagnostics

At clinical examination the mare showed good general condition. The external and internal genitalia were inconspicuous as assessed by transrectal palpation and vaginoscopy with a dilating speculum. The mare was in dioestrus.

The ultrasonographic examination of the uterus revealed distinct intraluminal anechogenic areas different from the typical shape of endometrial cysts (Fig. 1).

Fig 1 Ultrasonographic image of the left uterine horn (cross-section) before performance of intrauterine synechiolysis.
Ultrasonographisches Bild des linken Gebärmutterhornes im Querschnitt vor den chirurgischen Eingriffen.

Hysteroscopy was performed to permit a more detailed examination. The mare was restrained in stocks and tranquilised with an intravenous injection of 0.4 mg/kg xylazine (Xylapan®, Chassot, Ravensburg, Germany) and 0.075 mg/kg levomethadone (Polamivet®, Intervet, Munich, Germany). The tail was secured with a bandage and the perineal area prepared antiseptically. The endoscope (SIF 100, Olympus, Hamburg, Germany) was inserted transcervically into the uterus under digital control. Distension was achieved by insufflation of filtered atmospheric air using the endoscopic pump (cold light source: CLV-U20, Olympus, Hamburg, Germany). Hysteroscopy revealed a total occlusion of the corpus uteri without any passage of the uterine horns (Fig. 2).

Treatment

Intrauterine synechiolysis was performed on this mare in four operative hysteroscopies: an initial primarily diagnostic hysteroscopy followed by three additional sessions at time intervals of approximately four weeks. All hysteroscopies were carried out in dioestrus. After preparation of the mare, insertion of the endoscope and establishment of sufficient distension of the uterine cavity as described above, synechiolysis was achieved with high-frequency electrosurgery (Erbotom T400B, Erbe Elektromedizin, Tübingen, Germany). A monopolar high-frequency electrode (cutting needle) was placed via the working channel of the endoscope at locations designated for dissection and coagulation (Fig. 3). Multiple, string-like adhesions were dissected at one end and coagulated until the other end was reached. Septa were removed by making a series of centrifugally running incisions into the protruding tissue until it was leveled (Fig. 4).

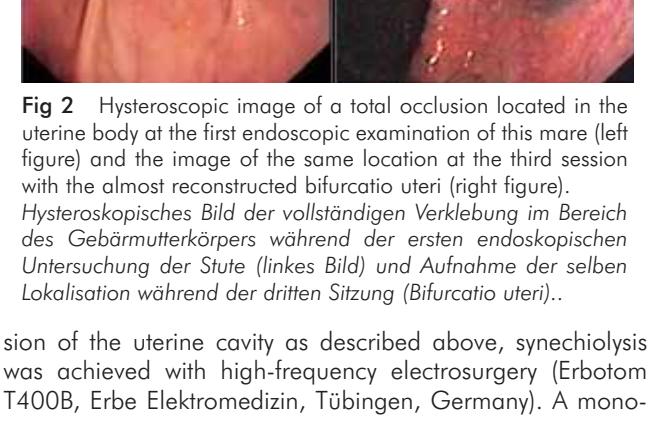

Fig 2 Hysteroscopic image of a total occlusion located in the uterine body at the first endoscopic examination of this mare (left figure) and the image of the same location at the third session with the almost reconstructed bifurcatio uteri (right figure).
Hysteroskopisches Bild der vollständigen Verklebung im Bereich des Gebärmutterkörpers während der ersten endoskopischen Untersuchung der Stute (linkes Bild) und Aufnahme der selben Lokalisation während der dritten Sitzung (Bifurcatio uteri)..

Fig 3 The cutting needle is placed via the working channel of the endoscope to dissect string-like intrauterine adhesions. Substantial occluding adhesions are seen in the background.
Die hochfrequenzchirurgische Klinge, vorgeschoben durch den Arbeitskanal des Endoskopes, ist zur Dissektion filliformer und spangenartiger intrauteriner Verklebungen placiert. Im Hintergrund sind massive, das Uteruslumen verlegende Adhäsionen zu sehen.

Three of the four hysteroscopies lasted between 25 and 35 minutes, while the second session could be continued for 75 min due to particularly favorable conditions for the surgical procedure. During this session it was necessary to administer additional xylazine after 40 min to maintain sedation. Sessions were terminated when further surgery would have increased the risk of perforation of the uterine wall, when uterine distension became inadequate, or when visibility became insufficient due to slight bleeding after dissection of substantial adhesions ("redout").

After completion of the surgical procedure the uterus was evacuated and antiseptically treated with 100 ml of a 1% povidone iodine solution (Braunol®, Braun, Melsungen, Germany), and oestrus was induced by application of 250 µg cloprostenol (Estrumate®, Essex Tierarznei, Munich, Germany). Only once, after the second session, was the uterus flushed two times, with physiological saline solution: immediately after hysteroscopy and again two days later, to remove the large amount of debris and pus resulting from the operative opening of caverns filled with purulent exudate. No antibiotics or NSAIDs were administered.

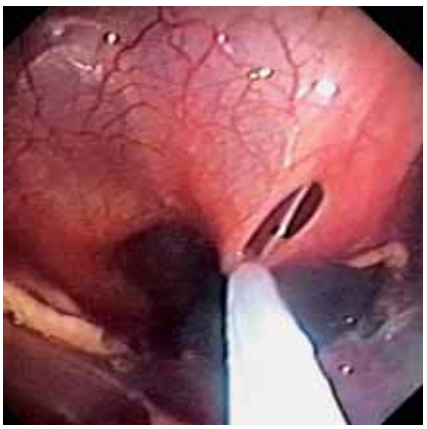

Fig 4 Hysteroscopic image of the dissection of a total intrauterine septum in this mare by centrifugally running incisions. Note the vascularisation of the adhesion.
Hysteroskopisches Bild der Dissektion eines deutlich vaskularisierten, vollständigen intrauterinen Septums durch zentrifugal gesetzte Inzisionen bei der Stute.

Results

During preparation it was possible to determine the extent of the adhesions. Cranially to the occlusion in the uterine body, there were multiple string-like adhesions, broad transluminal sheets and thicker partial septa in the right horn. The left horn was found to contain extensive plane adhesions (Fig. 5) and totally occluding septa bordering on caverns filled with purulent exudate.

There were no intra- or postoperative complications such as severe haemorrhage, pain or perforation of the uterine wall. There was only slight bleeding following synechiolysis of substantial adhesions, and haemostasis occurred quickly, probably due to the effective coagulatory potential of high-frequency electrosurgery.

After time periods of four weeks between the surgical hysteroscopies macroscopic examination revealed no inflammation, and the lesions were apparently healed. Some residues of carbonised material were to be seen imbedded in the tissue. Histological examination (according to *Schoon* et al. 1992) of an endometrial biopsy taken immediately after the third surgical hysteroscopy showed only a slight, non-purulent inflammatory reaction in addition to a moderate-to-high-level endometrosis (Category III; *Kenney* and *Doig* 1986).
Seven weeks following the last session a final hysteroscopic follow-up examination was performed. The passage of the uterine body and the right horn was completely restored, and the entrance to the right fallopian tube (Papilla uterina) could be seen. Most of intraluminal surface of those parts was covered with macroscopically intact endometrium, with only a few small areas of scarred tissue. In the left horn there was more scarring of endometrium, and the cranial part of the horn seemed to have re-adhered, so that it was not possible to reach the Papilla uterina.

Fig 5 Hysteroscopic image of the synechiolysis of extensive plane adhesions in the left uterine horn of this mare.
Hysteroskopisches Bild der Syechiolyse einer ausgedehnten flächigen Verklebung im linken Uterushorn der Stute.

Furthermore, the mare showed symptoms of an exudative endometritis, including purulent intrauterine fluid accumulation. There was a large amount of beta-haemolytic streptocci in a uterine swab taken immediately before the endoscopic examination. The endometritis was then treated five days by daily intramuscular injection of 15.000 IU/kg BW benzylpenicillin procain (Procain-Penicillin-G, WdT, Garbsen, Germany) and uterine lavages three times every other day with physiologic saline solution. In addition oestrus was induced by application of 250 µg cloprostenol (Estrumate®, Essex Tierarznei, Munich, Germany).

In the following breeding season the mare had no further endometritis and became pregnant, but the pregnancy was maintained only until the fourth month of gestation.

Discussion

There are only few reports about the incidence (*Mather* et al. 1979, *Bracher* et al. 1992) or even the occurrence (*Stone* et al. 1991, *Bracher* et al. 1992, *Allen* et al. 1997, *Kallenbach* 1999, *Bartmann* et al. 2000) of intrauterine adhesions, probably because it is not possible to make certain diagnosis during clinical and ultrasonographical gynaecological examination. Consequently diagnostic hysteroscopy should be performed to detect or exclude intrauterine adhesions, especially in infertile mares without any pathological findings at routine gynaecological examination.

In this clinically inconspicuous mare ultrasonographical examination of the uterus revealed pathological findings, but their exact nature remained unclear until hysteroscopy was performed. Anemnesis was unspectacular. Such mares often have a history of local uterine treatment with strongly irritating

substances such as concentrated iodine compounds or acrid antibiotics, or they have been subjected to intrauterine trauma by manipulation during foetotomy, by rough manual reduction of the secundinae, by endometrial currettage; or simply because of dystokia. But sometimes, as in this case, the aetiology remains unclear (*Bracher* et al. 1994, *Bartmann* et al. 2000).

Hysteroscopies were performed on this mare under sedation with xylazine and levomethadone, during dioestrus and with careful establishment of uterine distension in order to avoid super-elevated intrauterine pressure. These steps were proved before to enhance the surgical process and to be taken in the best interest of the mare (*Schiemann* et al. 2001b, *Bartmann* and *Schiemann* 2003).

The possibility to perform intrauterine synechiolysis using flexible scissors passed through the endoscopic working channel has been mentioned, as has mechanical removal of light adhesions (*Stone* et al.1991, *Bracher* et al. 1994). However where there are substantial adhesions those methods might be inadequate and could even result in haemorrhage.

Whereas *Bracher* et al. (1994) used a Nd:YAG laser for intrauterine synechiolysis, in this case high-frequency electrosurgery was used as described by *Bartmann* et al. (2000). Both techniques feature good coagulatory properties, which support haemostasis. But because of the unpredictability of the depth effect of laser energy, especially when high wattage is necessary, laser surgery might pose a higher risk of immediate or delayed uterine perforation, or of injury to the adjacent bowel (*Stein* and *Kendall* 1984, *Bartmann* et al. 2003b). In the present case, heat exposure was not a limiting factor. Even after the 75-minute session, the outcome was unproblematic for the mare, as was reported for eleven mares treated by *Bartmann* et al. (2000) using the same method.

Aside from loss of sufficient visibility due to slight bleeding (once in combination with loss of adequate uterine distension), the main reason for ending a session was to avoid excessive lacerations or even perforation of the uterine wall when it was no longer possibile to distinguish between adhesion and tissue that should not be destroyed. Four weeks between the hysteroscopic sessions proved to be practicable. After demarcation and rejection of the destroyed tissue the borders of the adhesions again became more obvious. There was sufficient time for aseptic inflammation after application of thermic energy to subside (*Bartmann* 2003b), and the endometrial surface appeared then to have healed or, depending on the depth of thermic injury (*Bartmann* 2003b), and presumably on the quality of the primary adhesion, remaining scarred tissue was assessable by endoscopy.
Because intrauterine contamination during hysteroscopy is likely in the mare despite antiseptic preparation of the external genitalia (*Schiemann* et al. 2001a), a follow-up treatment should be carried out as described, particularly in affected uteri with the likelihood of reduced clearance mechanisms. At the final follow-up examination this mare showed signs of a septic purulent endometritis that was responsive to treatment. *Bracher* et al. (1994) report susceptibility to endometrial infection after synechiolysis. In some mares endometrial inflammation remains resistant to treatment following intrauterine surgery (*Bartmann* et al. 2000).

The higher the degree of intrauterine adhesions according to the classification of *Bartmann* et al. (2000), the more intricate the surgical procedure. When passage can be largely reconstituted and inflammation reduced, the fertility prognosis after intrauterine synechiolysis is assumed to depend on the amount of sound endometrium remaining and the general degree of degenerative alterations. In this case ovulation of the left ovary might be without avail because of the re-adherence of the tip of the left horn. Furthermore the predominance of scar tissue in the left horn does not seem likely to support successful placentation. A partial hysterectomy of the left horn combined with ipsilateral ovariectomy could be performed to increase the likelihood of pregnancy (*Santschi* and *Slone* 1994, *Bartmann* et al. 2003a). But this step should be considered only as an exception, because it would involve great expense and in this case with the prospect of a guarded prognosis due to advanced endometrosis. Alternatively this intrauterine synechiolysis made it possible to use the mare as a donor for embryo transfer.

Hysteroscopy is the method of choice to detect intrauterine adhesions in infertile mares for which basic gynaecologic examination brings no pathological, or only unclear findings (*Stone* et al. 1991, *Bracher* et al. 1994, *Bartmann* et al. 2000). After performance of synechiolysis by means of thermal preparation techniques three quarters of the treated mares subsequently used for breeding conceived and achieved term (*Bracher* et al. 1994, *Bartmann* et al. 2000). But the prognosis is poorer if extensive adhesions are present, as in this case. As well as in women (*Römer* 1994) intrauterine adhesions are not always but often iatrogenic, but they often are having been caused by mechanical or chemical trauma of the uterus (*Stone* et al. 1991, *Bracher* et al. 1994, *Kallenbach* 1999, *Bartmann* et al. 2000). Therefore any unneccessary irritation of the endometrium should be avoided as far as possible.

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