J Vet Clin 29(5) : 408-411 (2012)

Journal of Veterinary Clinics
www.ksvc.or.kr

Successful Laparoscopic-Assisted Ovariohysterectomy in a Cat with Pyometra

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(Accepted: October 17, 2012)

Abstract : Laparoscopic-assisted ovariohysterectomy was performed in a cat (2.7 kg) with pyometra. A 10-mm operative laparoscope was inserted into the abdomen through an umbilical port. A transabdominal suspension suture was placed to maintain the exposure of the ovarian vascular pedicle. The ovarian vascular pedicle and suspensory ligament were progressively cauterized and transected with 5-mm multifunction bipolar grasping forceps. Both ovaries and the uterus were exteriorized via 5-mm caudal port enlarged to 2 cm. The uterine body and associated arteries were ligated, transfixed, and transected under direct vision. No peri- or post-operative complications were encountered. To the authors' knowledge, this is the first report of the use of laparoscopy for the treatment of pyometra in the cat.

Key words **:** feline, laparoscopic surgery, ovariohysterectomy, pyometra.

Introduction

Studies in dogs have indicated that laparoscopic surgery is superior to open surgery due to reduced postoperative pain (2,3,6) and physical stress response (9), as well as rapid post-surgical activity (1). Thus, laparoscopic procedures have been accepted as a viable alternative to traditional open procedures in veterinary medicine. Although this fact is much more common in the dog than the cat, a previous study (13) showed that laparoscopic ovariectomy is possible in cats and is a relatively simple procedure. Moreover, laparoscopic cryptorchidectomy (14) and laparoscopic resection of perinephric pseudocysts (11) were performed successfully in cats with the advantages of being minimally invasive and requiring only a brief hospital stay. The present paper reports successful treatment of pyometra by laparoscopic-assisted ovariohysterectomy in a cat.

Case

A 3-year-old, 2.7 kg, intact female Persian cat was admitted with abdominal distention, anorexia, and lethargy. From clinical and laboratory studies and radiographic examinations, pyometra was diagnosed.

On the next day of the presentation, laparoscopic-assisted ovariohysterectomy was performed with under the owner's permission. Cefazolin sodium (Cefazolin®, Chongkundang Pharm., Korea, 25 mg/kg, IV) was administered preoperatively. The cat was sedated using medetomidine (Domitor, Pfizer Animal Health Korea, Korea, 40 μg/kg, IM). General anesthesia was induced with propofol (Provive® 1%, Myungmoon Pharm., Korea, 3 mg/kg, IV titrated to effect) and maintained with isoflurane in 100% oxygen via endotracheal intubation in a circle rebreathing system. Additional analgesia was accomplished by administering butorphanol (Butophan®, Myungmoon Pharm., Korea, 0.44 mg/kg, IM). Monitoring consisted of electrocardiogram, capnography, pulse oximetry, respiratory rate, and rectal temperature performed throughout the anesthesia. Ventilator settings were adjusted to maintain the end tidal CO_2 partial pressure around 35-45 mm Hg throughout the procedure. Lactated Ringer's solution was administered intravenously during the procedure at a rate of 10 ml/kg/h.

The cat was positioned on a surgical table designed to facilitate rotation of the patient from dorsal recumbency to right or left lateral recumbency while maintaining an aseptic operative field (3). An umbilical port was placed 0.5 cm caudal to the umbilicus. Prior to the portal placement, the portal site was infiltrated with 1 ml of 0.5% bupivacaine. A modified technique of the standard closed trocar technique was used as described by a previous study (13). Briefly, a 1.4 cm skin incision was made, and subcutaneous tissues were dissected to visualize the linea alba. A suture was placed in the linea, and the abdominal wall was pulled upward. While pulling the abdominal wall upward, two stay-sutures were placed

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at the cranial and caudal border of the skin incision, penetrating skin, subcutis, abdominal wall, and peritoneum. Ventral traction on these sutures was maintained, and a small stab incision was made into the peritoneal cavity. A 12-mm cannula was inserted through the incision, avoiding trauma to visceral organs. Then, the two ends of each stay-suture were tied, respectively, to provide a tight fit of the cannula in the abdominal wall. The abdominal cavity was insufflated with CO_2 by an automatic insufflator (2232, Richard Wolf, Knittlingen, Germany). Intra-abdominal pressure was maintained at 4 mm Hg throughout the procedure. Through the cannula, a 10-mm operative laparoscope (0^o) with a 6×270 mm operating channel (OP-Telescope 429-62000, MGB, Berlin, Germany) was inserted into the abdomen.

Using the surgical table, the cat was rotated so that the right ovary was uppermost. Five-millimeter grasping forceps (Atraumatic grasping forceps, Richard Wolf, Knittlingen, Germany) were inserted through the operating channel of the laparoscope. The right ovary was grasped and pulled to the abdominal wall. A polyglyconate monofilament transabdominal suspension suture with a GS-21 (large taper) needle (MAXON, Tyco healthcare, Gosport, UK) was placed at the junction of the ovary and suspensory ligament and held outside the abdomen temporarily by Pean forceps (4) (Fig 1). While the needle was advanced through the abdominal wall, care was taken not to penetrate the distended uterine horn under laparoscopic observation. The ovarian vascular pedicle and suspensory ligament were progressively cauterized and transected with 5-mm multifunction bipolar grasping forceps (Tripol Powerblade, LiNA Medical ApS, Glostrup, Denmark). Then, the cat was rotated so that the left ovary was uppermost. The left ovarian vascular pedicle was identified, and the exposure was maintained with a transabdominal suspension suture. The ovarian pedicle and suspensory ligament were cauterized and transected in a similar fashion.

After completing the division of both ovarian pedicles and suspensory ligaments, the cat was returned to dorsal recumbency. Under laparoscopic visualization, to avoid injuring the urinary bladder, a 5-mm trocar was inserted 7 cm caudal to the umbilical port. The proposed trocar sites were transilluminated to help identify vessels in the abdominal wall so that they could be avoided during trocar insertion. Atraumatic grasping forceps were inserted through the caudal port and used to clamp the left ovary still attached to the suspension suture. Then, the forceps were withdrawn with the cannula after releasing the transabdominal suspension suture. Insufflation of the abdomen was stopped. In order to allow ease of exteriorization of the ovary and associated uterine horn, the port site was enlarged to 2 cm with care taken not to damage the distended uterine horn. Then, the contralateral ovary and uterine horn were also exteriorized by a hand-over-hand maneuver (Fig 2). The uterine body and associated arteries were ligated, transfixed, and transected at the mid-cervical

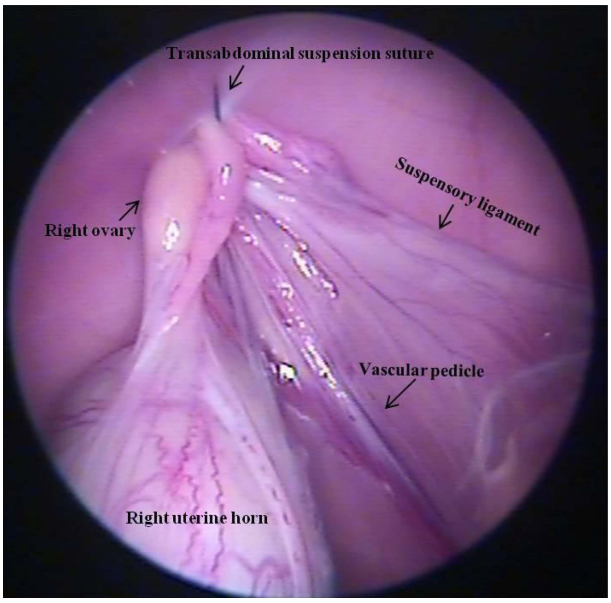

Fig 1. A transabdominal suspension suture was placed at the junction of the ovary and suspensory ligament to maintain the exposure of the ovarian vascular pedicle in a cat with pyometra.

Fig 2. The distended uterus was exteriorized through the enlarged caudal port in a cat with pyometra.

level under direct vision. The ligated uterine stump was reintroduced into the abdomen. After pneumoperitoneum was reestablished, the remnant of the pedicle and the uterine stump were examined for hemorrhage by visual inspection using a laparoscope. Once it was determined that there was no gross hemorrhage, the laparoscope and remaining umbilical trocar were withdrawn, and manual pressure was carefully applied to each side of the abdominal wall to facilitate the escape of CO_2 gas from the abdominal cavity. Abdominal incisions were closed with separate sutures in the abdominal musculature, subcutaneous tissue, and skin. Atipamezole (Antisedan, Pfizer Animal Health Korea, Korea, 100 μg/kg, IM) and butorphanol (0.2 mg/kg, IM) were administered at the end of the procedure. Surgical time, from the initial skin incision to the final closure of all the incisions, was 37 min. The diameter of the exteriorized uterine horn was 2.2 cm. The total incision length of the abdominal wall was 3.7 cm.

The cat recovered uneventfully from anesthesia. On the next day-after surgery, the cat was comfortable and discharged to the owner. Sutures were removed after 10 days, and the incision healed uneventfully. When followed up 5 weeks after surgery, no clinical complications were observed.

Our literature survey indicated that this was the first report of use of laparoscopy for the treatment of pyometra in a cat. Ovariohysterectomy is the surgical procedure of choice to treat pyometra in veterinary medicine. A mini-laparotomy technique is often used for sterilization in the cat. When there is limited exposure due to a small abdominal incision and when a spay hook is used in a blind fashion, the risk of inadvertent trauma to abdominal tissue is theoretically increased, although it has not been investigated (13). Because iatrogenic risk may be greatly increased in a cat with pyometra, making a relatively long abdominal incision is unavoidable. In the present case, total incision length of the abdominal wall was only 3.7 cm. This incision seems relatively smaller in length than the length required for a laparotomy in a cat with pyometra. Moreover, technically, the laparoscopic-assisted procedure presented here to treat pyometra was relatively easy to accomplish and did not increase the operation time significantly.

Laparoscopic-assisted ovariohysterectomy to treat pyometra was first published in dogs (10). In the previous technique published in dogs, a 4-portal access technique was used. Portal placement can cause significant complications during the laparoscopic procedure, and risk may increase as the number of the ports' increases. In addition, adding more instruments through additional trocars may limit ease of movement and manipulation inside the abdominal cavity, especially in a cat with pyometra. In order to minimize the surgical trauma and the potential damage to the distended uterus, we used a 2-portal access technique as described in a previous dog study (3). Moreover, the passage of an endosurgical grasper through the caudal port was limited, unless the ovaries and uterus were exteriorized. An operating laparoscope with an instrument channel and a transabdominal suspension suture enable this 2-portal access technique. The use of transabdominal suspension suture could eliminate the need for additional portals to allow passage of the endosurgical grasper to maintain exposure of the ovarian vascular pedicle (3,4,12). However, because the suspension suture can bring the tissue being transected too close to the abdominal wall, prior to application of the cautery mode, the tissue should be retracted away from the abdominal wall to avoid collateral thermal injury (3).

In dogs, increases in intra-abdominal pressure are proportionally related to decreases in caudal vena caval flow and cardiac output (8). Safe intra-abdominal pressure to avoid complications caused by hemodynamic derangements is considered as 8-12 mm Hg in dogs (7). However, safety limits of intra-abdominal pressure have not been established in cats, and various intra-abdominal pressures, including 10-12 mm Hg (11), 11 mm Hg (14), and 4 mm Hg (13) were used previously. Van Nimwegen and Kirpensteijn (13) indicated that the 4 mm Hg CO_2 pressure allows full visibility of all essential abdominal organs in cats during laparoscopic ovariectomy. In this case, in agreement with the previous report, although the uterine horns were distended bilaterally in the abdominal cavity, 4 mm Hg CO_2 pressure generated sufficient abdominal space to manipulate laparoscopic instruments and abdominal tissues without damage to the distended uterus.

Laparoscopic procedure can result in major or minor complications, including penetration of vital organs, subcutaneous emphysema, pneumothorax, gas embolism, and incisional hernia (5). No surgical complications were encountered during the procedure reported here. However, care should be taken to avoid iatrogenic puncture of the distended uterus. In this case, while the umbilical port was placed, the abdominal wall was pulled upward by 2 stay-sutures placed at the cranial and caudal border of the skin incision. Moreover, a slightly longer linea alba incision was made compared to the diameter of the cannula. These techniques may lessen the risk of uterine puncture by allowing ease of insertion of the cannula. Van Nimwegen and Kirpensteijn (13) indicated that because of a less-tight fit of the trocar in the abdominal wall, an effort should be made to keep the trocars in place during laparoscopic ovariectomy in cats. In this case, even though the linea alba incision was slightly longer than the diameter of the cannula, by knotting each stay-suture after cannula insertion, a tight fit of the cannula in the abdominal wall was maintained and leakage of CO_2 gas from abdominal cavity was prevented. To our knowledge, this technique has not been suggested before. In this case, the transabdominal suspension suture was placed as described in a previous dog study (4). However, the needle was directed not to the proper ovarian ligament but to the junction of the ovary and suspensory ligament so that inadvertent uterine puncture was avoided.

In conclusion, laparoscopic-assisted ovariohysterectomy using 2-portal access can be a viable treatment option for pyometra in the cat. The procedure is minimally invasive, technically simple, and not time consuming. However, fur-

ther studies of a larger number of cases are required to investigate the advantages and rate of complication associated with this technique compared to the traditional open technique.

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고양이의 자궁축농증에서 복강경을 이용한 난소자궁절제술

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요 약 : 자궁축농증으로 내원한 고양이에서 복강경을 이용한 난소자궁절제술을 시행하였다. 먼저 제대 port를 통해 5 mm working channel을 가진 10 mm 복강경을 복강내로 삽입하였다. Working channel을 통해 복강 내로 도입된 atraumatic grasping forceps을 이용하여 난소를 배측복벽으로 견인한 후 난소 동,정맥을 노출시키기 위해 난소를 배측복벽에 일시적으로 고정시키는 transabdominal suspension suture를 적용하였다. 난소 동, 정맥과 난소걸이인대는 5 mm multifunction bipolar grasping forceps을 이용하여 순차적으로 소락절제하였다. 양쪽 난소의 절제 후, 제대 port의 꼬리쪽 방향에 5 mm 직경의 추가 port를 장착하였다. 추가 port를 통해 grasping forceps을 복강 내로 삽입한 후 절제된 난소와 자궁을 복강 밖으로 배출하였다. 이때 자궁의 배출이 용이하도록 port의 직경을 2 cm로 확장하였다. 자궁몸체와 자궁동맥은 복강 밖에서 결찰 후 절제하였다. 술 후 5주간의 관찰 결과, 복강경수술과 관련된 어떠한 부작용도 관찰되지 않았다. 본 증례는 고양이에서 자궁축농증 치료에 복강경을 적용한 예이다.

주요어 : 고양이, 복강경수술, 난소자궁절제술, 자궁축농증