There are a number of minimally invasive surgical (MIS) procedures that are currently performed using laparoscopy. Many of these procedures require multiple trocar/cannula portals, specific minimally invasive surgical instruments, loop ligatures, clip applicators, and monopolar electrosurgery. The techniques described below are the “tip of the iceberg” of the potential for MIS in veterinary medicine.

**Intestinal Biopsy**

Small intestinal biopsies can be obtained using the laparoscope simply by exteriorizing a piece of intestine through the abdominal wall and then collecting the sample externally, as would be done in a standard surgical biopsy. A 5-mm atraumatic grasping forceps with multiple teeth is used to grasp the intestine at the site to be biopsied. It may be necessary to “run” the bowel with two grasping forceps to select a location to biopsy. The antimesenteric border is firmly grasped with the forceps. The intestine is then pulled to the cannula. A 3–4 cm loop of intestine is exteriorized. A small, full-thickness biopsy is then obtained in the same manner as one would use when performing an open abdominal surgical technique. The intestine is then returned to the abdominal cavity. If too much intestine is exteriorized, it is difficult to return it to the abdominal cavity through a small incision.

**Intestinal Feeding Tube Placement**

Duodenostomy or jejunostomy feeding tubes can be placed using the laparoscope simply by exteriorizing a respective piece of intestine through the abdominal wall and inserting the tube externally. Once the location of the bowel for tube placement is determined, the antimesenteric border is firmly grasped with the forceps. The intestine is then pulled close to the cannula in which the intestine will be exteriorized. A 3–4 cm loop of intestine is exteriorized and 4 stay sutures (4-0 monofilament absorbable) are placed in the intestine to prevent the intestine from falling back into the abdominal cavity. A purse-string suture is placed on the antimesenteric border of the intestine. A number 11 blade is used to puncture the intestine in the middle of the purse-string suture, and the jejunostomy feeding tube (5 French for cats and 8 French for dogs) is introduced in the loop of bowel in the aboral direction. The purse string suture is closed and the intestine is returned to the abdominal cavity, except for the segment containing the feeding tube. The stay sutures are then used to pexy the intestine to the abdominal wall using 4.0 monofilament absorbable sutures. The abdominal wall is then closed with simple continuous suture pattern. Subcutaneous tissue and skin are closed in a routine fashion. The feeding tube exits through the incision.

**Gastropexy**

A preventive gastropexy can be performed using the laparoscope simply by exteriorizing the pyloric antrum region of the stomach through the right abdominal wall. The animal is placed in dorsal recumbency and the telescope portal is placed on the midline at the level of the umbilicus. A 5-mm atraumatic grasping forceps with multiple teeth is used to grasp the pyloric antrum mid-distance between the lesser and the greater curvature. The pyloric antrum is exteriorized after extension of the cannula site situated behind the last rib on the right side. An incisional gastropexy is then performed.

**Ovariohysterectomy /Ovariectomy**

Ovariohysterectomy or ovariectomy can be performed using laparoscopy in most medium and large dogs. The space in the abdominal cavity of small dogs and cats makes the procedure technically very difficult. The advantage of this technique is the perceived rapid patient recovery following the procedure.

The procedure can be performed in either lateral recumbency or dorsal recumbency. Several different approaches have been described, each with advantages and disadvantages. We prefer to use a dorsal recumbency approach and tilt the table at 15 degrees, with the head of the dog in a dependent position.

Following insufflation of the abdominal cavity using a Veress needle and CO₂, the cannula for the telescope is introduced cranial to the umbilicus. Instrument ports are then placed at the level of the umbilicus on the edge of the rectus abdominalis muscle. In the caudal abdomen the uterus is visible lying over the colon. After moving loops of intestine and omentum that are covering the ovarian pedicle, one uterine horn is grabbed with a fine tooth grasper and pulled caudally to expose the ovarian pedicle. Electrocauterization is used to cauterize the suspensory ligament while cutting with the scissors. A hole is then made in the mesovarium, isolating the ovarian pedicle. The ovarian pedicle can be ligated with suture, vascular clips, or electrocautery. After placing 2 sutures or 2 vascular clips on the
ovarian pedicle, it is then transected with Metzenbaum scissors. The second ovarian pedicle is then dissected and ligated in a similar fashion.

If only an ovariectomy is performed, another ligature will be placed on each uterine horn before transecting the ovaries from the uterus. Both ovaries will be removed through one cannula site.

If an ovariohysterectomy is being performed, a pre-tied loop of suture (Endoloop Suture™ or Loop Ligature™) is placed in the abdominal cavity through one of the cannula. Both ovaries and uterine horn are then passed through the loop. The loop is then tightened down at the level of the cervix. Metzenbaum scissors are used to transect the cervix cranial to the suture. Both ovarian pedicles and the cervix are inspected for bleeding. The uterus and both ovaries are removed through one of the cannula holes, which must have been enlarged to receive the uterus and ovaries. The enlarged cannula site is sutured with a simple continuous suture pattern with 2-0 monofilament absorbable suture material. Subcutaneous tissue and skin are closed in a routine fashion. The other cannula sites require only subcutaneous and skin sutures.

**Cryptorchid Surgery**

A testicle that is located in the abdominal cavity can be removed easily with laparoscopy. Laparoscopic vasectomy can also be performed through this technique. The dog is placed in dorsal recumbency with the table tilted at 15 degrees, with the head of the patient in the lower position. Gravity will then displace the abdominal organs in the cranial abdomen, which will facilitate visualization of the internal inguinal canal. The monitor is placed at the end of the table as described for ovariohysterectomy surgery.

The ectopic testicle is usually readily visible upon entering the abdominal cavity. The ectopic testicle of one side rarely ever crosses the midline but stays lateral to the bladder on the affected side. The testicle is grabbed with a fine tooth grasper. The gubernaculum is divided with Metzenbaum scissors and electrocautery if needed. The vascular pedicle and the vas deference are ligated with a pre-tied suture or clips. The ectopic testicle is removed through one of the cannula holes, which generally must be enlarged. The enlarged cannula site is sutured with a simple continuous suture pattern with 2-0 monofilament absorbable suture material. Subcutaneous tissue and skin are closed in a routine fashion. The other cannula sites require only subcutaneous and skin sutures.

**Laparoscopic Cystoscopy**

Laparoscopic cystoscopy is an alternate method that allows placement of a laparoscopic telescope into the urinary bladder, which has been exteriorized through the abdominal wall for examination, biopsy, and calculi removal. The technique involves a standard laparoscopic entry, with the telescope placement on the abdominal midline cranial to the umbilicus. Once the urinary bladder is visualized, a second trocar cannula is placed directly over the urinary bladder at the location of exteriorization. Using atraumatic forceps with multiple teeth, the bladder is grasped and pulled into the trocar cannula as described in the intestinal biopsy section. Once the apex of the bladder is exteriorized, stay sutures are placed from the bladder wall. The bladder is temporally perxied to the abdominal wall. A small incision is made in the bladder wall, the bladder is then flushed with sterile saline, and the telescope is introduced into the bladder. Forceps can be placed in the lumen along the telescope to obtain a biopsy or remove calculi. At the conclusion of the procedure the bladder is closed in a standard manner and placed back into the abdomen. The cannula ports are then closed. The pexy is released and the abdomen closed in a routine fashion.

Laparoscopy is a minimally invasive technique for diagnostic and surgical procedures. Once the basic technique of laparoscopy is mastered and the appropriate indications are applied to the procedures, it becomes a simple and rewarding addition to small animal veterinary medicine and surgery. As our ability advances, newer diagnostic and therapeutic procedures will no doubt be developed.