

COMPARISON OF LAPAROSCOPIC-ASSISTED AND OPEN COLOPEXY IN DOGS

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Abstract

The objective of this study was to describe laparoscopic-assisted colopexy (LAC) technique, and compare the extent of the surgical trauma after LAC and open colopexy (OC) by examining postoperative serum values of C-reactive protein (CRP) in dogs. Twelve healthy mixed-breed dogs with body weight ranging from 15 to 25 kg were used. Two portal sites were used for LAC procedures. OC was performed by laparotomy on linea alba. Colopexy was accomplished in all dogs without major intraoperative and postoperative complications. A permanent adhesion between the colon and abdominal wall was observed. There were statistically significant differences in serum CRP levels between LAC and OC immediately after the procedure and 1 d post operation. LAC had a similar pexy effect to OC, but had fewer surgical trauma than OC in dogs.

Key words: dog, colopexy, laparoscopy, C-reactive protein.

Colopexy is a common surgical procedure to provide a permanent adhesion between the colon and abdominal wall. It has been used for treatment of the recurrent rectal prolapse and torsion of the descending colon (10, 12).

Laparoscopic procedures are minimally invasive surgical techniques that have excellent outcomes, minimal incision, low complication rate, rapid postoperative recovery, lower pain scores, and improved patient convalescence, compared with open surgical procedures. It obtained a rapid development in veterinary medicine (4, 5, 16). The disadvantage of laparoscopy is the need for specialised equipment, adequate training and longer surgical time. Therefore, laparoscopic-assisted surgery is becoming increasingly popular in the treatment of small animals, using laparoscopic-assisted gastropexy (9, 14), cystopexy (13), and ovariohysterectomy (6), and placement of jejunostomy feeding tube (2, 7).

Colopexy has been achieved through celiotomy (1, 8, 11) and laparoscopic-assisted technique in dogs (13). However, complication developed as a result of leakage from needle holes in the colon in the case of laparoscopic-assisted colopexy (LAC) technique (13). There are no data comparing the surgical trauma after laparoscopic-assisted and open colopexy (OC) techniques in dogs. Thus, the objective of the presented study was to describe LAC technique, and compare the extent of surgical trauma after laparoscopic-assisted and OC by examining postoperative serum values of C-reactive protein (CRP).

Material and Methods

Animals. Twelve healthy mixed-breed adult dogs, aged 0.8 to 5 years, weighing 15 to 25 kg were studied. The dogs were divided into two equal groups: LAC group and OC group.

Surgical technique. All dogs were found to be healthy on the basis of physical examination and complete blood count (CBC). Feed was withheld for 12 h, and water for 6 h before surgery to decrease risk of damage to viscera during cannula placement. The dogs were premedicated with atropine (0.04 mg/kg, b.w.) and 15 min later they received intramuscularly 1.5 mg/kg of xylazine and 20 mg/kg of ketamine. The animals were positioned in dorsal recumbency. The ventral abdomen (from the xiphoid to the pubis and to each inguinal fold) was shaved, aseptically prepared, and draped for surgery.

Peripheral blood samples were obtained prior to anesthesia, immediately after the procedure, and on days 1, 3, 5, and 7 post operation for measurement of serum CRP levels by ELISA.

Surgical procedures were performed by the same surgeon and two assistant surgeons. The descending colon was sutured to the left ventral abdominal wall approximately 2.5 cm lateral to the ventral midline.

LAC technique. A 10/11-mm trocar-cannula unit for laparoscope (Olympus, Germany) was placed on the midline, 1-2 cm caudal to the umbilicus. A second 10/11-mm trocar-cannula unit was placed approximately 2.5 cm to the right of ventral midline for laparoscopic

Babcock forceps (Optcla Medical Instrument Co., Ltd, China).

The anti-mesenteric section of descending colon was identified and grasped by laparoscopic Babcock forceps. The Babcock forceps were removed from the abdomen along with the cannula, exteriorising the descending colon by laparoscopic guidance to prevent the torsion of the descending colon. The incision in the abdominal musculature was enlarged to a length of 3-4 cm. Two traction sutures of 2-0 polyglycolic acid suture were placed in the colon 3-4 cm apart. The serosa and muscular layers of the colon were incised between the traction sutures avoiding entering the lumen of the colon. Each edge of the seromuscular colonic incision was sutured separately to the corresponding edge of the incision in the abdominal wall musculature in a simple continuous fashion with 2-0 polyglycolic acid suture. The abdominal muscles were closed in a continuous pattern, and the skin incision apposed in a simple interrupted pattern.

OC technique. A ventral midline was performed from the level of the umbilicus to 8-10 cm caudal to the umbilicus. The descending colon was located and exteriorised. A 3-4 cm longitudinal incision was made along the antimesenteric border of the descending colon. Only the serosal and muscular layers were incised without mucosal penetration. A similar incision on the left abdominal wall 2.5 cm to the linea alba through the peritoneum and underlying muscle was made. Each edge of the colonic and abdominal wall incisions was apposed in a simple continuous fashion with 2-0 polyglycolic acid suture. Abdominal wall was closed in two layers with 2-0 polyglycolic acid suture.

Postoperative care and monitoring. Systemic antibiotics (Ampicillin, 20 mg/kg, i.m., every 8 h) were administered for 5 d. Subjective assessment of the dogs' behaviour and appetite, together with the measurements of temperature twice a day and CBC once a day were performed 7 d after surgery. Water was offered 2 h and feed 6 h after surgery.

Postmortem and histological evaluation. A month after operation, the dogs were euthanised. The adhesions and surrounding colon and abdominal wall muscle was collected and placed into 10% neutral buffered formalin for histological examination.

Statistical analysis. Standard statistical methods were used for the analysis of all results. Data are reported as mean $\pm$ SD. Statistical differences within each group were determined by one-way ANOVA. Paired-samples T Test was used to compare the two groups. Significant level was established as $P < 0.05$. Statistical analysis of data was performed with computer software (SPSS, USA).

Results

All dogs recovered from the colopexy procedure without apparent surgical complications. Mean surgical time was not significantly different

($P < 0.05$) between LAC group (51.67 ± 8.50 min) and OC group (48.33 ± 6.81 min). Total length of all skin incisions was 4-5 cm in LAC group and 8-10 cm in OC group. Leakage from colon and infection did not occur clinically.

Postmortem, one month after the operation, a focal fibrous secure adherence was observed between the descending colon and the abdominal wall in all dogs. No other abdominal abnormalities were found in both groups. All adhesions were characterised by a thick band of well-organised fibrous connective tissue. Haemorrhage and inflammation were detected. The fibrous connective tissue was composed of collagen fibers. No differences in the amount of collagenous connective tissue could be observed histologically in both groups.

Serum CRP levels increased significantly at days 1 and 3 after operation in OC group and LAC group ($P < 0.05$). There were statistically significant differences in serum CRP levels between LAC group and OC group immediately after the procedure and 1 d post operation. ($P < 0.05$).

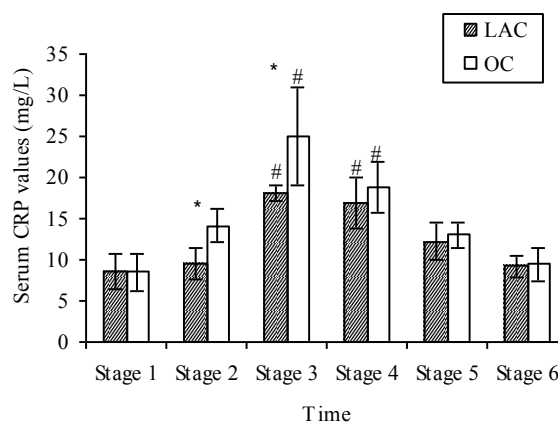


Fig. 1. Changes in C-reactive protein (CRP) in laparoscopic-assisted colopexy (LAC) and open colopexy (OC) groups. Stage 1 - before surgery; Stage 2 - immediately after the procedure; Stage 3 - 1 d post operation; Stage 4 - 3 d post operation; Stage 5 - 5 d post operation, Stage 6 - 7 d post operation. * $P < 0.05$ compared to LAC, # $P < 0.05$ compared to preoperative serum levels.

Discussion

LAC was performed in six healthy dogs, without major intraoperative or postoperative complications. Thus LAC is an alternative technique to colopexy. The laparoscope was inserted into abdomen to view the descending colon. The identified descending colon was easy to exteriorise from instrumental portal site. The incisional colopexy technique was used for LAC and OC groups. This technique had been certified to be a safe and effective pexy method (12, 13, 14). The

descending incision was the same length as the skin incision. In the direct view, the seromuscular colonic incisions apposed to the abdominal wall musculature could be done easily. Histological characteristics of both LAC and OC adhesions suggest that adhesions related to colon fixation method rather than surgical method. LAC formed the secure adherence and produced a similar pexy effect with OC.

Canine CRP has a molecular weight of 100 kD, which consists of 5 subunits of 20 kD each. It is one of the acute-phase proteins that increase as a result of inflammatory response to infection or tissue damage. The changes in serum CRP levels are more useful than the WBC count for assessing the severity of inflammation (3, 15). In this study, serum CRP increased rapidly after surgery. Time of maximum peak of its concentration was 1 d after surgery and this increase was significant compared with CRP concentration before the anaesthesia. Our results were in accordance with those of a previous study, which also concerned the trauma after surgery (3). The increase in serum CRP subjected to surgery was generally related to the intensity of the surgical trauma in the dog (15). There were statistically significant differences in serum CRP levels between LAC group and OC group immediately after the procedure and 1 d post operation. This suggests that LAC produces result in a lesser trauma than OC. Therefore, LAC is a good alternative technique for colopexy in dogs.

References

1. Brissot H.N., Dupre G.P., Bouvy B.M.: Use of laparotomy in a staged approach for resolution of bilateral or complicated perineal hernia in 41 dogs. *Vet Surg* 2004, **33**, 412-421.
2. Chandler J.C., Kudnig S.T., Monnet E.: Use of laparoscopic-assisted jejunostomy for fecal diversion in the management of a rectocutaneous fistula in a dog. *J Am Vet Med Assoc* 2005, **226**, 746-751.
3. Conner J.G., Eckersall P.D., Ferguson J., Douglas T.A.: Acute phase response in the dog following surgical trauma. *Res Vet Sci* 1988, **45**, 107-110.
4. Davidson E.B., Moll H.D., Payton M.E.: Comparison of laparoscopic ovariohysterectomy and ovariohysterectomy in dogs. *Vet Surg* 2004, **33**, 62-69.
5. Dupré G., Fiorbianco V., Skalicky M., Gültiken N., Ay S.S., Findik M.: Laparoscopic ovariectomy in dogs: comparison between single portal and two-portal access. *Vet Surg* 2009, **38**, 818-824.
6. Gower S., Mayhew P.: Canine laparoscopic and laparoscopic-assisted ovariohysterectomy and ovariectomy. *Compend Contin Educ Vet* 2008, **30**, 430-440.
7. Hewitt S.A., Brisson B.A., Sinclair M.D., Foster R.A., Swayne S.L.: Evaluation of laparoscopic-assisted placement of jejunostomy feeding tubes in dogs. *J Am Vet Med Assoc* 2004, **225**, 65-71.
8. Landon B.P., Abraham L.A., Charles J.A., Edwards G.A.: Recurrent rectal prolapse caused by colonic duplication in a dog. *Aus Vet J* 2007, **85**, 381-385.
9. Mayhew P.D., Brown D.C.: Prospective evaluation of two intracorporeally sutured prophylactic laparoscopic gastropexy techniques compared with laparoscopic-assisted gastropexy in dogs. *Vet Surg* 2009, **38**, 738-746.
10. Milner H.R., Newington A.N.: Longitudinal colonic torsion as a cause of tenesmus in an adult Irish Water Spaniel. *N Z Vet J* 2004, **52**, 40-43.
11. Niles J.D., Williams J.M.: Perineal hernia with bladder retroflexion in a female cocker spaniel. *J Small Anim Pract* 2008, **40**, 92-94.
12. Popovitch C.A., Holt D., Bright R.: Colopexy as a treatment for rectal prolapse in dogs and cats: a retrospective study of 14 cases. *Vet Surg* 1994, **23**, 115-118.
13. Rawling C.A., Howerth E.W., Mahaffey M.B., Foutz T.L., Bement S., Canalis C.: Laparoscopic-assisted cystopexy in dogs. *Am J Vet Res* 2002, **63**, 1226-1231.
14. Rawlings C.A., Foutz T.L., Mahaffey M.B., Howerth E.W., Bement S., Canalis C.: A Rapid and strong laparoscopic-assisted gastropexy in dogs. *Am J Vet Res* 2001, **62**, 871-875.
15. Yamamoto S., Shida T., Miyaji S., Santsuka H., Fujise H., Mukawa K., Furukawa E., Nagae T., Naiki M.: Changes in serum C-reactive protein levels in dogs with various disorders and surgical trauma. *Vet Res Commun* 1993, **17**, 85-93.
16. Zhang J.T., Wang H.B., Liu Y.F., Sun Y.G., Shao J.T., Shi J.: Laparoscopic splenectomy in goats. *Vet Surg* 2009, **38**, 406-410.