

Evaluation of pyloroplasty repair by single layer simple interrupted extra mucosal technique in Dogs

Humam H. Nazht¹; Dhyaa Ab. Abood² and Omer Mohammed Sabeel³

¹Department of Surgery and Obstetrics, ²Department of Anatomy, Histology and Embryology, College of Veterinary Medicine, Baghdad University, ³Private clinic, Iraq.

E-mail: Humam_nazhat@yahoo.com

Received: 13/7/2016

Accepted: 30/11/2016

Summary

In this study a pyloroplasty technique was designed by using a single layer simple interrupted extra-mucosal suture pattern on pyloric region in dogs. Nine adult dogs were used to induce longitudinal surgical incision in the pyloric region under general anesthesia using a combination of 15mg/kg B.W. ketamine hydrochloride 5% and 5 mg/kg B.W Xylazine hydrochloride 2%. The incision was closed by pyloroplasty technique (longitudinal incision for whole layers with transverse suturing) using single layer simple interrupted extra mucosal technique. The examination was achieved by daily clinical observation, radiological finding, at the end of 21st day post operation, macroscopical and histopathological examination at the period 3rd, 7th, and 21st days post operation. The results showed no significant clinical changes in body temperature and physiological activity. The radiological findings showed good patency of the pyloric canal after 21st days post operation. The macroscopic finding showed heavy amount of the omentum adhered around the site of incision. The microscopic finding showed good healing process by re-epithelization of the mucosal layer associated with granulation tissue proliferation, angiogenesis, and less infiltration of mononuclear inflammatory cells. The conclusion indicated that single layer simple interrupted extra mucosal suture pattern technique can be used successfully in repair the pyloric stenosis in dogs.

Keywords: Pyloric stenosis, Pyloric region, Extra-mucosal suture pattern.

Introduction

Pyloric stenosis is a condition characterized by hypertrophy of the circular fibers muscular of the pyloric antrum, leading to reduction in diameter of the pyloric orifice. It is seldom diagnosed prior to weaning. The cause may be hereditary or acquired due to tumor of pyloric region. Numbers of extra and intra luminal factors are responsible for pyloric stenosis, which begins as spasm, and later leads to muscular hypertrophy and complete obstruction (1). Different procedures have been employed to relive pyloric stenosis in dogs like pyloromyotomy, pyloroplasty (Transverse or YU advancement techniques) and partial or complete pylorectomy (2). Most clinical anastomosis was made by two-layer or all bowel layer technique and had been practically incorporated in the first suture line; also a modification in gut anastomosis technique has been adopted worldwide. But many trials and clinical studies have proven the superiority of single layer anastomosis, which besides being safe and quicker to create is strong as two layer anastomosis (3 and 4). Single layer extra mucosal interrupted

intestinal anastomosis is simple, safe and is associated with less risk of dehiscence (4). In another study with continuous single layer, extra mucosal technique shows the rate of anastomosis dehiscence as 1.7% in stomach (5). This study aimed to evaluate the pyloroplasty technique by using single layer simple interrupted extra mucosal suture pattern which can be used in the repair of pyloric region in dogs.

Materials and Methods

Nine physically healthy adult male dogs, were used in this study, their ages were (2.2 ± 6) years and the body weights were (20.5±2) kg. They were kept 7 days in the animal house of the Surgery and Obstetrics department/ College of Veterinary Medicine/ Baghdad University prior to the study, and de-wormed with Ivermectin at a dose of 0.2 mg/kg B.W S/C.

Food Withheld for 24 hrs. and water for 12 hrs. prior to operation. The area was prepared for aseptic surgical operation from the xyphoid cartilage to the pubis as a routine procedure. Dog was premedicated by 0.04 mg/kg. B.W.

Atropine sulphate, 10 min. later general anesthesia was induced by intra-muscular administration of 15 mg/kg. B.W. Ketamine hydrochloride 5% and 5 mg/kg. B.W. Xylazine hydrochloride 2%. The operation was done according to (6). Cranial midline laparotomy was performed, pulled the stomach to identify the pylorus. Two stay sutures of 2/0 silk induced in the pylorus, surround the area with sterile wet gauze. A full-thickness longitudinal incision (4-5) cm was made in the ventral surface of the pylorus. The pylorus was closed with pyloroplasty technique using single layer simple interrupted extra mucosal pattern. The stomach was re position, and routinely closure of abdominal wall. The operated dogs were infused with intravenous fluid with glucose 5% therapy for 48 hours post operation and systemic antibiotics for 5 days post operation (20.000 IU/ kg B.W) penicillin and (10 mg/kg B.W) streptomycin post operative, the skin stitches were removed 8-10 days after operation.

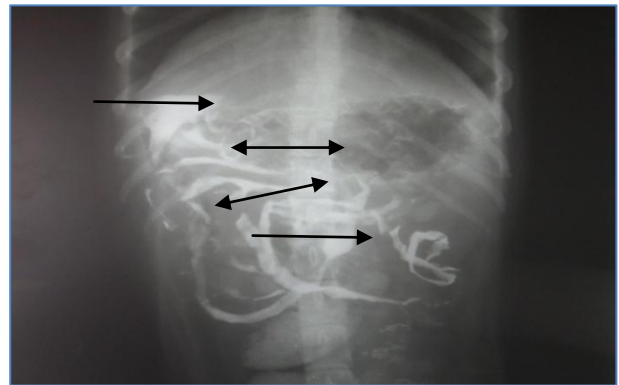
The operative sites were inspected daily for presence of any infection or complications and the physiological activities which include animal behaviors, vomiting, urination, defecation, and normal gait were also observed. Radiographic images were taken at 21st day postoperation, the animals were fasted 12 hrs. prior to radiographic technique, oral drenching of barium suspension, which prepared by adding 15 g of barium sulfate to enough water to obtain a total volume of 100 ml (7). After 10-15 min. the animals stomach were radiographically viewed with dorsal position, ventro-dorsal view, the exposure factors are Kv=60-65, mas=3-3.5, F.F.D.=30-36 Inches.

Macroscopic examination of the pyloric region were performed at period 3, 7 and 21 day post operative for detection any abnormalities such as adhesion, and inspection the line of incision from inside after euthanized of the animals. The microscopic examination were done at the same period of macroscopic examination, 1cm specimen of the pylorus was taken and fixed in 10% neutral formalin for 48 hours and routine preparation then sectioned at (5-6) nm thickness staining with Hematoxylin-Eosin (H and E) done according to (8).

Results and Discussion

Operated dogs were showed reduced in appetite then they retain to normal physical activity 5-6 days post operation. Two dogs in both groups showed signs of vomiting three days after operation then retained to normal condition. There was slight swelling at the site of incision 2-4 days post operation, and then gradually disappeared after 5th day post operation. The skin wound healed satisfactorily in all dogs without complication.

The gastro- graphic image 21st days post operation showed patency with no stenosis in the pyloric region and the contrast media passing within the small bowl as shown in (Fig. 1).



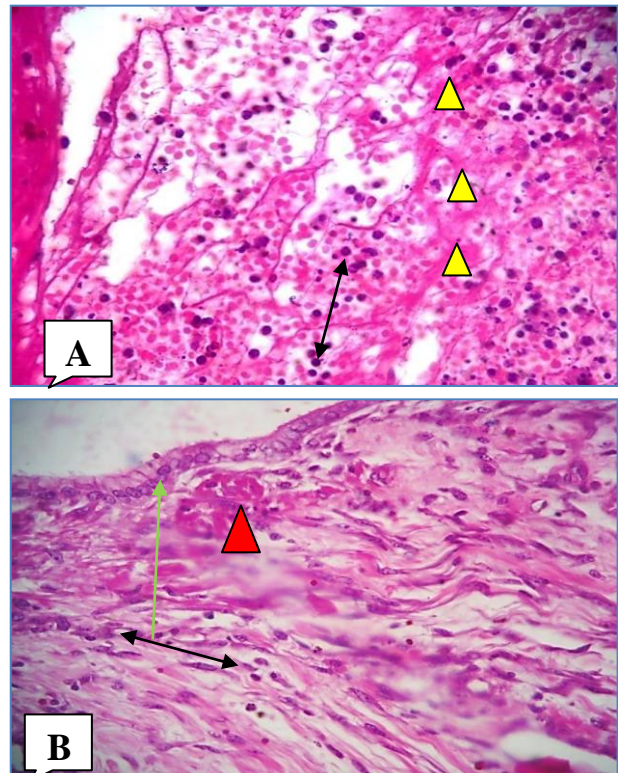
Figure, 1: Radiographic image of pyloric region showed patency of the pyloric canal at 21st days post operation Ventro -Dorsal view.

The reduction in the physiological activates post operation then returned gradually to the normal condition, this agree with other researchers which evaluation in horse and dogs (9 and 10) which later disappear. The vomiting sign which appeared in two dogs post operation then returned to normal was may be due to the complications after pyloroplasty technique this coincided with (11). The Skin wound healed satisfactorily in all dogs. These results were agree with the result of (12), that the inflammatory reaction which occurs immediately after skin incision is due to blood vessel and cell membranes damaged that release inflammatory factor like thromboxanes and prostaglandins that cause the vessel spasm to prevent blood loss and to collect inflammatory cells, and the histamine in the area, leads to vasodilatation, of blood vessels (13 and 14). The vomiting cases which recognized early in two cases were may be due to the undigested food that presents, seven

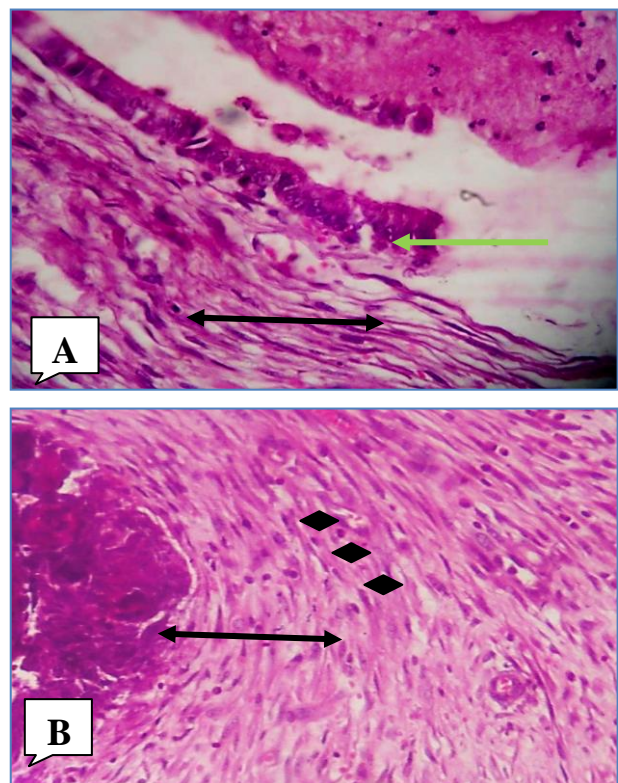
hours after eating. This can be recognized from clinical observation and then later it disappeared. This statement agrees with (15) who record that one of the most clear and important signs after gastric operation to correct the pyloric stenosis, the partial or complete pyloric stenosis which may occur during the inflammatory phase of pyloroplasty technique and may lead to vomiting. The patency of the pyloric canal at 21st days post operation which recognized by gastrographic image agree with (6) who mention that Pyloromyotomy and pyloroplasty increase the diameter of the pylorus which can be used to correct the pyloric obstruction. Also the same statement mentioned by (16), in which they proved to increase diameter of pyloric canal after euthanasia assessment

The macroscopic finding revealed enlargement of the pyloric region and still visible of mucosal line at the end of 3rd and 7th days post operation and but at 21st days post operation the incision line disappeared. The macroscopic examination revealed that the enlargement of the pyloric region may be due to adhesion of the gastric omentum and fibrous tissues formation around the incision. In other word, this adhesion enhanced gastric healing which may be due to the omentum providing sufficient blood supply, lymphatic drainage, and prevents the leakage the stomach content in the abdominal cavity this fact agree with others authors (17).

The histopathological examination at three day post operation showed massive fibrin deposition, infiltration of polymorph nuclear cells (PMNC) and mononuclear cells (MNCs) together with hemorrhage re epithelialization of incision line by columnar layer and fibroblasts proliferation with blood vessels congestion (Fig. 2 A and B). Seven day post operation, partial re-epithelialization at the incisional space with columnar epithelial layers, proliferation of collagen fibers, slight appearance of neutrophils with fibroblasts proliferation and angiogenesis resulting in immature granulation tissue formation with MNCs infiltration, mainly consist of macrophages and plasma cells with congested blood vessels, the large amount of granulation tissue replaced all sub-mucosa layer together with slight hyperplasia of epithelial mucosa accompanied with necrotic cells-remnant (Fig. 3 A and B).

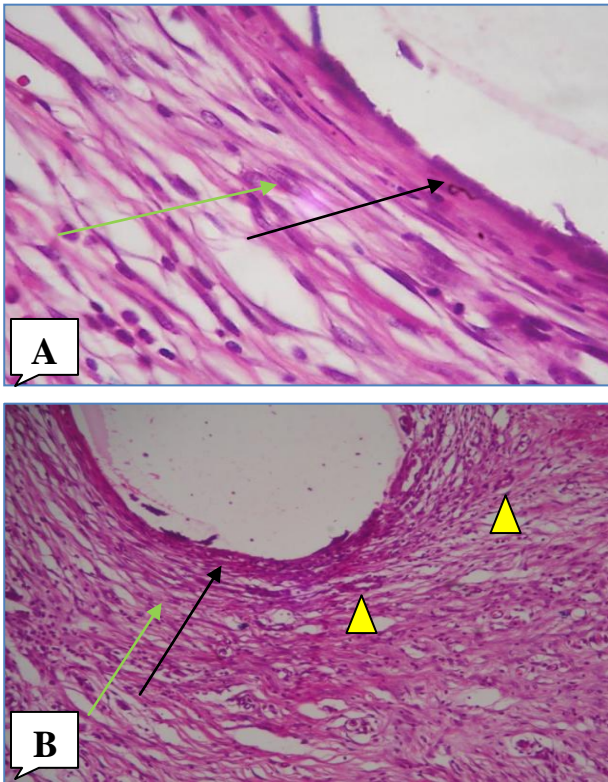


Figure, 2 (A-B): Show blood clotted **▲** with fibrin deposition **▲** together with PMN leukocytes infiltration **↔** re-epithelialization of inscisional margin by thin layer of columnar epithelial **→** sutured by extra-mucosal pattern, three days post operation (H and E., 40X).



Figure, 3 (A-B): Show partial re-epithelialization of incision space by columnar epithelial **→**, proliferation of collagen fibers **↔** and decrease in the number of the neutrophils, large amount of granulation tissue **◆** that replaced all sub-mucosa **↔**, together with slight hyperplasia of epithelial mucosa that accompanied with necrotic cells remnant extra mucosal pattern one week post operation (H and E 40X).

21st day post operation, re-epithelialization of incisional space, with fibrous connective tissue (shrinkage collagen fibers), With congested blood vessels and cellular infiltration, the abundant collagen fibers organization accompanied with MNCs aggregation, (Fig. 4 A and B).



Figure, 4 (A-B): Show proliferation of fibrous connective tissue with MNCs infiltration → together with remnant of thin epithelialization of incisional space →, closure of the incisional space accompanied with appearance of congested blood vessels ▲ with cellular infiltration, sutured by extra-mucosal pattern, 21st days post operation (H and E, 40X).

The histopathological examination at three days post operation shows hemorrhage and infiltration of inflammatory cells which may be due to the action of chemical mediators released from platelets leading to increase of blood vessels. This observation was mentioned by other researcher (13 and 18). While the examination seven days post operation showed granulation tissue formation and revealed that the proliferation phase started besides that the good appositions of mucosal incision margin and increases blood circulation to enhance the healing process. On other hand (6 and 19) showed that the appearance of necrotic tissues accompanied with infiltration of inflammatory cells lead to delay healing process. The fibroblasts begin entering the wound site as the inflammatory phase is ending and onset of

proliferative phase, this statement agreed with (20 and 21).

At 21st days post operation the examination shows many fibroblasts in the wound site which indicates that the wound is well closed and revealed good healing process in the mature phase. This result conforms with other authors (18, 22 and 23) who found that the appearances of the fibroblasts cells were indications of the progressing stages of healing process, and healing steps in the proliferative phase, and ending of the inflammatory phase. This can be recognized by the development of granulation tissue in the incisional site and covered by epithelial layer that consist of cuboidal or columnar cells with chief cells and surrounded by thick fibrous connective tissue and infiltration mononuclear cells between mucosal glands and sub epithelial layer.

References

1. Lawther, W. A. (1991). Pyloric stenosis in a puppy. *Aust. Vet. J.*, 37: 317-319.
2. Slatter, D. (2003). Shape of stomach, role of fundus, gastric acid-blocking drugs. (cimetidine) before surgery In: *Text Book of Small Animal Surgery*, 3rd Ed. Elsevier Sciences U.S.A. Pp:175, 506, 593.
3. Lodhi, F. B.; Farooq, T.; Shafiq, M. and Hussain, R. (2006). Anastomotic leak after small gut surgery. *Professional Med. J.*, 13: 47-50.
4. Rajput, M. J.; Memon, A. S.; Rani, S. and Khan, A. I. (2009). Use of single layer extramucosal interrupted suture intestinal anastomosis: three year experience. *J. Liaquat Uni. Medical. Health Sci.*, 8:26-28.
5. Zoedler, T.; Becker, H. and Roehrer, H. D. (1995). Continuous single layer anastomosis as the standard procedure in the gastrointestinal tract. *Der Chirurg; Zeitschrift fur alle Gebiete der operativen Medizin*, 66(1):50-53.
6. Fossum, T. W. and Hedlund, C. S. (2007). *Surgery of the digestive system. Small Anim. Surg.*, 3:339-530.
7. Morgan, J. P. (1993). *Techniques of Veterinary Radiography*, 5th Ed. Iowa State University Press, Ames, Iowa. Pp:315.
8. Prophet, E. B.; Mills, B. and Arrington, J. B. (1992). *Laboratory methods in histotechnology*. Washington: Armed Forces Institute of Pathology. Pp: 275.
9. Hanson, R. R.; Nixon, A. J.; Calderwood –Mays, M. and Gron wall, R. (1988). Evaluation of three techniques for end – to – end anastomosis of

- small colon in horses. Am. J. Vet. Res., 49:1613-1620.
10. Kachiwal, A. B. and Kalharo, A. B. (2000). Kachiwal, A. B. and Kalharo, A. B. (2000). Evaluation of two suturing techniques for end-to-end anastomosis of colon in dogs. Pakistan Vet. J., 20(3):142-146.
 11. Margallo, M.; Sánchez, B.; Loscertales, I.; Díaz-Güemes and Usón, J. (2007). Technical feasibility of laparoscopic finney pyloroplasty examined in a canine model. Surgical Endoscopy, 21:136-139.
 12. Tani, M.; Terasawa, H.; Kawai, M.; Ina, S.; Hirono, K. and Uchiyama (2006). Improvement of delayed gastric emptying in pylorus-preserving pancreaticoduodenectomy: Results of a prospective, randomized, controlled trial. Ann. Surg., 243:316-20.
 13. Fowler, D. (1993). Principle of wound healing in the small animal practice sunders company, Pp:2-27.
 14. Theoret, C. L. (2004). Update on wound repair. Clinical Techniques in Equine Practice, 3 (2):110-122.
 15. Takeshi Fujita, Hitoshi Katai, Shinji Morita, Makoto Saka, Takeo Fukagawa and Takeshi Sano (2009). Short-term outcomes of roux-en-y stapled anastomosis after distal gastrectomy for gastric adenocarcinoma. J. Gastrointest. Surg., 14:289-294.
 16. Park, P. O.; Bergström, M.; Ikeda, K.; Mosse, S.; Kochman, M. and Swain, P. (2007). Endoscopic pyloroplasty with full-thickness trans gastric and trans duodenal myotomy with sutured closure. Gastrointest Endoscopy 66:121-122.
 17. Crha, M.; Lorenzová, J.; Urbanová L.; Fichtel, T. and Nečas, A. (2008). Two techniques of intestinal wall suture in surgical treatment of ileus in dogs and the importance of omentalisations. Acta. Vet. Brno., 77:263-267.
 18. Deodhar, A. K.; and Rana, R. E. (1997). Surgical physiology of wound healing: A review. J. Postgrad. Med., 43(2):52-56.
 19. Weisman, F. L.; Smeak, D. D and Birchard, S. J. (1999). Comparison of a continuous suture pattern with a simple interrupted pattern for enteric closure in dogs and cats: 83 cases (1991-1997). J. Am. Vet. Med. Assoc., 214:1507-1510.
 20. Stadelmann, W. K.; Digenis, A. G. and Tobin, G. R. (1998). Physiology and healing dynamics of chronic cutaneous wound. Am. J. Surg., 176(2):26-38.
 21. Ballantyne, G. H. (1983). Intestinal suturing. Review of the experimental foundations for traditional doctrines. Dis. Colon. Rectum, 26(16):836-843.
 22. Eichler, M. J. and Carlson, M. A. (2006). Modeling dermal granulation tissue with the linear fibroblast-populated collagen matrix: a comparison with the round matrix model. J. Dermal. Sci., 41(2):97-108.
 23. Ibrahim, J. K. (2010). A comparative study between cross mattress and schmiedens suture techniques on colon end-to-end anastomosis in goats. M.Sc. thesis, Vet. Med. Coll. Baghdad Uni. Iraq.

التقويم البوابي في الكلاب باستعمال تقنية خياطة الصف الواحد من البسيط المتقطع للطبقة تحت المخاطية

¹ همام حسام الدين محمد نزهت و ² ضياء عبد الحسين عبود و ³ عمر محمد خلف سبيل

¹ فرع الجراحة والتوليد البيطري، ² فرع التشريح والأنسجة والأجنة، كلية الطب البيطري، جامعة بغداد، ³ عيادة بيطرية خاصة، بغداد، العراق.

E-mail: Humam_Nazhat@yahoo.com

الخلاصة

هدفت الدراسة لتقييم استعمال تقنية خياطة الصف الواحد من البسيط المتقطع تحت المخاطية المنطقة البوابية في الكلاب. استعملت 9 كلاب ناضجة واستحدث فيها شق جراحي في المنطقة البوابية من المعدة تحت التخدير العام باستعمال مزيج الكيتامين هيدروكلورايد وبجرعة 15 ملغم/كغم من وزن الجسم بتركيز 5%، الزيلازين وبجرعة 5 ملغم/كغم من وزن الجسم بتركيز 2%. أغلق الجرح بتقنية التقويم البوابي (إحداث شق طولي يشمل كل الطبقات وخياطته بالخياطة المستعرضة) باستعمال خياطة الصف الواحد من البسيط المتقطع من تحت المخاطية. أجريت المتابعة السريرية يومياً والفحوصات الإشعاعية في نهاية اليوم الواحد والعشرين بعد العملية. أما الفحوصات العيانية والنسجية المرضية فاجريت في نهاية اليوم الثالث والسابع والواحد والعشرين بعد العملية، أظهرت نتائج الفحوصات السريرية عدم وجود فرق معنوي يذكر في درجات الحرارة والفعاليات الفسلجية، أما الفحوصات الإشعاعية فقد أظهرت وجود انفتاح المجري البوابي في اليوم الحادي والعشرين بعد العملية أما الفحوصات العيانية فأظهرت وجود التصاق الخلب وبكمية كبيرة حول منطقة العملية، أما الفحوصات النسجية المرضية فقد أظهرت استمرار في مراحل الالتئام متمثلاً بإعادة بناء الطبقة الطلانية للطبقة المخاطية مع نضوج وتكاثر النسيج الحبيبي والأوعية الدموية وقلة ارتشاح الخلايا وحيدة النواة الالتهابية، نستنتج مما أجريناه أعلاه إمكانية الإستعمال الناجح لتقنية خياطة الصف الواحد من البسيط المتقطع للطبقة تحت المخاطية في المنطقة البوابية في علاج حالات التضيق البوابي في الكلاب.

الكلمات المفتاحية: التضيق البوابي، المنطقة البوابية، تقنية الخياطة تحت المخاطية.