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Comparison of two jejunal anastomosis techniques in dogs treated preoperatively with dexamethasone

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Abstract

The aim of this study was to evaluate effects of steroidal antiinflammatory drugs that given before surgery on two intestinal anastomosis techniques in dogs. Thirty-two adult local breed dogs were equally and randomly divided into 2 groups: group 1: consist of 16 dogs underwent apposition End-To-End jejunal anastomosis using simple interrupted suture technique and divided this into 2 subgroups: subgroup A: consist of 8 dogs treated preoperatively for 15 days with dexamethasone at a dose of (0.1ml/kg) given I/M. Subgroup B: control group consists of 8 dogs not treated with dexamethasone. Group 2: consist of 16 dogs underwent inverted End-To-End jejunal anastomosis using continuous Lumbert suture pattern and divided this into 2 subgroups: subgroup A: consists of 8 dogs treated preoperatively for 15 days with dexamethasone at a dose of (0.1ml/kg) given I/M. Subgroup B: control group consist of 8 dogs not treated with dexamethasone. The result showed the adhesion at anastomosis site with omentum was more severe in the group one when compared with the group two. The degree of stenosis rate was lower in group one after 7 days of operation (22.7±8.2) while the degree of stenosis rate was higher in the group two after 15 days (54.9±4.1). The anastomotic bursting pressure was significantly lower in the all steroidal subgroups at 7 and 15 days compared with the control subgroups.

Keywords: Jejunum; Dexamethasone; Adhesion; Stenosis; Pressure.
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مقارنة بين تقنيين لتفمم الصائم في الكلاب المعاملة بالدكساميثازون قبل العملية الجراحية

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الخلاصة

كان الهدف من الدراسة تقيم تاثير الادوية المضادة للالتهاب السيرويدية التي تعطى قبل العملية الجراحية على طريقتين لتفمم الامعاء في الكلاب. تم استخدام ٣٢ حيوانا من الكلاب البالغة المحلية تم تقسيمها عشوائيا و بالتساوي الى مجموعتين: المجموعة الاولى: تتالف من ١٦ كلبا اجريت عليها عملية استئصال وتفمم الامعاء باستخدام طريقة نهاية الى نهاية وبتقنية تقابل الطبقات وباستخدام طريقة الخياطة البسيطة المتقطعة وتنقسم هذة المجموعة الى فرعين: المجموعة الفرعية A: ضمت ٨ كلاب تم اعطاءها عقار الدكساميثازون لمدة ١٥ يوم قبل العملية الجراحية وبجرعة (٠,١ مل/كيلوغرام) تعطى عن طريق العضلة. المجموعة الفرعية B: ضمت ٨ كلاب وتعتبر مجموعة سيطرة (بدون اعطاء عقار الدكساميثازون). المجموعة الثانية: تتالف من ١٦ كلبا اجريت عليها عملية استئصال وتفمم الامعاء باستخدام طريقة نهاية الى نهاية وبتقنية الحافات المقلوبة للداخل وباستخدام طريقة الخياطة اللمبرت المستمرة وتنقسم هذة المجموعة الى فرعين: المجموعة الفرعية A: ضمت ٨ كلاب تم اعطاءها عقار الدكساميثازون لمدة ١٥ يوم قبل العملية الجراحية وبجرعة (٠,١ مل/كيلوغرام) تعطى عن طريق العضلة. المجموعة الفرعية B: ضمت ٨ كلاب وتعتبر مجموعة سيطرة (بدون اعطاء عقار الدكساميثازون). اظهرت النتائج ان الالتصاقات التي حصلت في موقع التفمم مع الثرب كان عالي في المجموعة الاولى التي استخدم فيها تقنية تقابل الطبقات عند مقارنتها مع المجموعة الثانية. كما اظهرت النتائج بان معدل درجة التضيق كان قليل في المجموعة الاولى (٢٢,٧±٨,٢)بينما معدل درجة التضيق كان

عالي في المجموعة الثانية (٩,٥٤±٤,١). كما اظهرت النتائج ان قوة الضغط النفجاري اقل بكثير في المجموعات الفرعية الاستيرويدية عند اليوم ٧ و١٥ بعد العملية عند مقارنتها مع المجموعات السيطرة الفرعية.

Introduction

Intestinal anastomosis is an important surgical procedure that connects two sections of the intestine once a diseased portion has been removed. A key concern is to prevent leakage at the anastomosis site and subsequent peritonitis, but this complication can be avoided if the procedure is done correctly and preventive measures are taken (1). Different techniques were used to intestinal anastomosis, which include inversion, eversion, or opposition, and most of these techniques associated with different complications such as leakage, adhesion, stenosis, and peritonitis, which depending on suture materials, technique, patient's condition and skill of surgeon (2). Intestinal anastomosis in domestic animals, the indication for this surgical operation is comparatively high only in the case of intestinal obstruction of the dog (3). Intestinal resection and anastomosis is recommended for removing ischemic, necrotic, neoplastic, or fungus-infected segment of intestine, irreducible intussusceptions are also managed by resection and anastomosis (4). Also in case devitalization, irresolvable obstructionor segmental dysfunction, or irreparable perforation of the intestines (1). Corticosteroid is antiinflammatory and immunosuppresive effects. Antiinflammatory effects are complex but primarily occur via inhibition of inflammatory cells and suppression of expression of inflammatory mediators (5). Corticosteroid have been used in an attempt to treat practically every disease that afflicts man or animals. The action of corticosteroids on gastrointestinal tract are increase the secretion of gastric acid, pepsin and trypsin they alter the structure of the mucine and decrease mucosal cell proliferation (6). Also usage in gastrointestinal disease to tide the patient over a critical period of the disease in ulcerative colitis and enteritis (7). Mechanism of action of corticosteroids are: inhibition of the release of arachidonic acid, decrease synthesis of cyclooxygenase-2 (COX-2), inhibition of the production of cytokines, and effect on the concentration, distribution, and function of peripheral leukocytes (8). Despite massive progress in the medical treatment of inflammatory bowel diseases (IBD), corticosteroids still represent the most effective drugs in the management of acute IBD. Unfortunately, surgical intervention under treatment with corticosteroids is often complicated by impaired intestinal wound healing. The aim of our study was to assess the effects of the corticosteroids dexamethasone on intestinal anastomosis in vivo to identify potential causes for impaired intestinal wound healing under corticosteroid treatment.

Materials and methods

Experimental animals

Thirty-two adult local breed dogs, weighing 15-30 kg, from both sexes, aged from 1.5-3 years were used in this study. The dogs were divided randomly into two groups, sixteen from each group and each group divided into two subgroups, eight for each subgroup. Each animal underwent surgery was fastened from food for 24 hours, 12 hours from the water. Anesthesia induced intramuscularly, by a mixture of xylazine (5 mg/kg) and ketamine hydrochloride (15 mg/kg), and maintained by i.m. administration of increment doses from the same mixture when demanded. The ventral abdominal wall was prepared for aseptic surgery from xyphoid cartilage to umbilical area, a 7-10 cm midline incision was made on the skin in linea alba by scalpel then by blunt dissection with scissors the abdomen was opened. A loop of jejunum was exteriorized through a laparotomy incision with the packing of laparotomy sponges. About 5 cm jejunum loop was selected for resection. a double ligation were made to the mesenteric blood vessels which supply the pieces of the jejunum that will be resected and the contents of the jejunal loop was milked a way from resection site followed by application of 2 straight intestinal clamp (Doyen's intestinal forceps) one on either side of the proposed resection site, then start resection the jejunal loop with scissors along the outside of the forceps by a perpendicular incision at each side, Normal saline (Nacl 0.9%) was applied continuously on jejunum out of the abdominal cavity along the time of the operation to avoid dryness, the two ends of the resected jejunum were approximated as follows; in group one simple interrupted suture technique (apposition technuique) by using polyglycolic acid size 3-0 begin from mesenteric border and the mesentery by simple interrupted suturing. In group two Lumbert's suture pattern (inverted technique) by using polyglycolic acid size 3-0 begin from mesenteric border and the mesentery by simple continuous suturing.

Then the anastomosis site was checked for leakage by application of gentle pressure on the site of anastomosis, followed by a thorough cleaning of anastomosis site and jejunal loop with normal saline to remove any blood clot before returning it to the abdominal cavity. The abdominal wall incision and skin was closed routinely, and antibiotic spray was applied on the skin incision. Systemic antibiotic, pencillin-streptomycin was injected intramuscularly, daily for 3 to 5 days at a dose rate of 10,000 IU/kg body weight and 10 mg/kg body weight, respectively. Four animals from each subgroup at 7 and 15 days after operation were anesthetized. A piece of 20-25 cm of jejunum including

anastomotic site was removed and kept in normal saline for further studies. The jejunal specimen which containing the anastomotic site was closed from one ends by ligation or by intestinal forceps then filled from other end with 10 % barium sulfate, till complete destination of the jejumal specimen, then closure the second end by using intestinal forceps and radiographed in order to calculate the degree of stenosis using the following formula 100 {1-2A/ (B+C)}, where A; width of intestine at anastomotic site, B and C for width of intestine 2 cm proximal and 2 cm distal to the anastomotic site respectively. The mechanical strength of the anastomosis was determined by bursting pressure, which represents the resistance of the jejunum to intraluminal pressure, by using a sphygmomanometer which was modified to be fit for this purpose. Any leakage from the anastomosis site was revealed by the presence of bubbles. The pressure value recorded as leakage pressure was that one which immediately preceded the pressure fall concomitant with the emission of bubbles or disruption of the bowel. The result statistically analyzed using ANOVA and Duncan test. The level of significant was at ($P<0.05$).

Result

The gross pathological examination for the possibility of any serious complication like leakage, peritonitis, abscessation or necrosis as well as dehiscence of anastomosis site was not recorded in both groups. Adhesion of the omentum to the site of anastomosis was higher in the group one, in comparison with the group two (Fig.1-4).

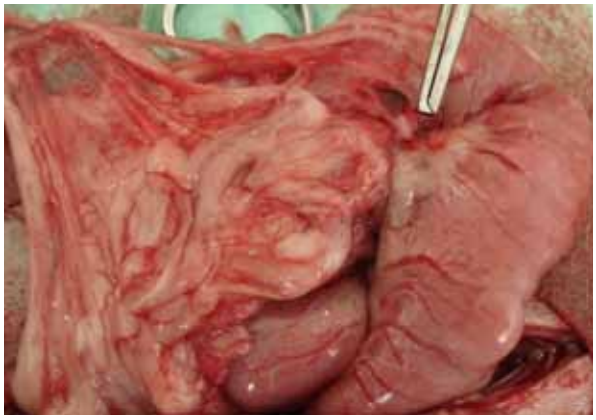

Figure (1) adhesion of the omentum to the site of the anastomosis in group one apposition technique.

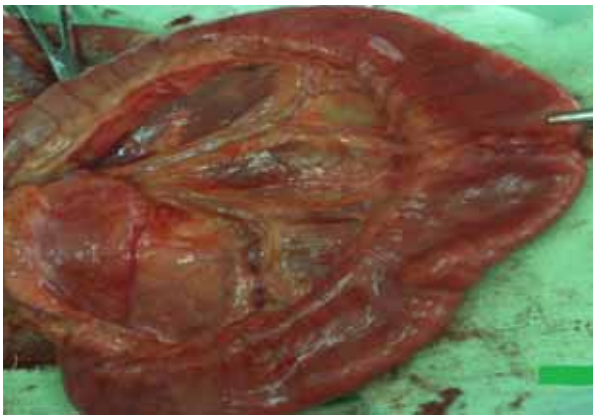

Figure (2) no adhesion in the site of the anastomosis with omentum in group two invert technique.

Figure (3) adhesion the site of the anastomosis with other loop in group two invert technique.

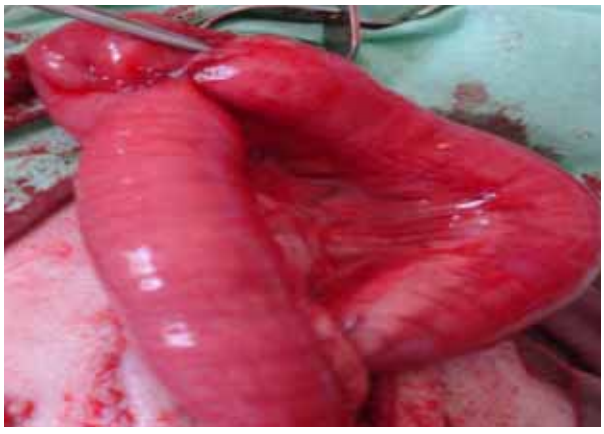

Figure (4) adhesion the site of the anastomosis with other loop in group one apposition technique.

Radiological study of the degree of stenosis

Intestinal specimens that have been taken after 7 and 15 days post operation were examined and the mean table (1). The degree of stenosis rate was lower in the group one after 7 days of operation (22.7±8.2) while the degree of stenosis rate was higher in the group two after 15 days (54.9±4.1).

Anastomotic durability was measured by bursting pressure. Mean anastomotic bursting pressures are given in table (2). The mean bursting pressure values were lower in all of the steroid treatment groups and higher in all control groups. It has been observed during shedding the pressure on the intestines in steroidal groups for measuring bursting pressures rupture in serous layer but not observed in the control groups. The results showed there was no rupture or leakage from the anastomotic site in the inverted group, but happened away from the site of anastomosis any area of intact bowel in most of the animals of this group, but in the apposition group, the rupture and leakage was happening in the site of anastomosis in all animals of this group.

Table (1) shows the mean degree of stenosis of intestinal anastomosis and the stander error (S.E.) of both groups at 7 and 15 days.

Groups	Apposition of the layers technique by using simple interrupted sutures		Invert technique by use single row of continuous Lumber suture Pattern	
Subgroups	Control group	Steroidal group	Control group	Steroidal group
Mean of degree of anastomotic stenosis at 7 days.	22.7 ± 8.2 A,a	37.6 ± 2.7 B,a	38.9 ± 3.9 B,a	39.4 ± 3.6 B,a
Mean of degree of anastomotic stenosis at 15 days.	35.8 ± 1.3 A,b	30.5 ± 4.8 A,a	32.8 ± 1.7 A,a	54.9 ± 4.1 B,b

A,B the different letter in each row refer to significant differences (P<0.05).
a,b the different letter in each column refers to significant differences (P<0.05).

Table (2) shows the mean of bursting pressure ± stander erroes (S.E.) for the both groups after 7 and 15 days.

Groups	Apposition of the layers technique by using simple interrupted sutures		Invert technique by use single row of continuous Lumber suture Pattern	
Subgroups	Control group	Steroidal group	Control group	Steroidal group
Mean of bursting pressure at 7 days (mmHg)	440 ± 11.6 A,a	270 ± 30 B,a	370 ± 34.2 C,a	255 ± 25.3 B,a
Mean of bursting pressure at 15 days (mmHg)	425 ± 22.2 B,a	257.5 ± 6.3 C,a	445 ± 9.6 B,b	290 ± 10 C,a

A-C the different letter in each row refer to significant differences (P<0.05).
a,b the different letter in each column refers to significant differences (P<0.05).

Discussion

There are no difference between the steroid group and the control group in terms of adhesions and this reverse to have been proved by researcher (9). But there is a difference in the degree of adhesion between the apposition groups and inverted groups, the adhesion in the apposition groups were higher than inverted groups and this coincide with other authors (10,11). The adhesion in the site of the anastomosis in the apposition groups was more than this in the inverting groups and this agree with other authors (12) when they reported simple inflammation in case of apposition suture such as simple interrupted, simple continuous and modified Gambee's sutures. As for the second group the adhesion was limited which can be attributed to the inverted technique thus preventing exposure internal layers of the intestine to the abdominal cavity which lead to a lack of appropriate conditions for the proliferation of bacteria and get an infection and adhesion in the region this is identical to what mentioned (13) when he pointed into that the appearing of the mucosal layer helps occurrence of adhesion.

The results of measuring the degree of stenosis in both groups, we found that the best result obtained by using the apposition of the layers, where the average degree of stenosis was (22.7± 8.2) at the 7 days from postoperative days and the difference significantly statistician for the inverted technique and this agree with other authors (14) when mentioned that the apposition technique lead to lack of stenosis in the site of anastomosis. But the average degree of stenosis in group two when using inverted technique was (54.9 ±4.1) this agree with other authors (15,16) when said that the degree of stenosis caused by inverted technique is greater than that caused by the

enverted technique or apposition technique. The stenosis which occurs in inverted technique in this experiment may be due to excessive coup edges to the inside, and this agrees with other authors (12) which stressed that despite the high degree of stenosis caused by this method, but it is an acceptable, and successful method in the process of intestinal anastomosis in horses.

That of the methods used to measure the strength of anastomosis site is measuring the strength of the bursting pressure which is a pointer to indicate the efficiency of the healing process (17,18). The results of measuring the bursting pressure in the two groups revealed a significant difference between animals treated with steroid and the animals untreated with steroid in the same group, The mean bursting pressures values were lower in all of the steroid treatment groups and higher in all control groups and this agree with other authors (9,19-21). Several other studies concluded that only long term steroid treatment significantly weakens colonic anastomosis when use steroid for 60 days (22-24) this disagree with our study when use steroid for 15 days this confirm presence weakens in the site of intestinal anastomosis, confirm previous results on an impaired healing of colonic anastomosis upon corticosteroids treatment (23,25). In the present study, observed the corticosteroids have negative effect on the site of anastomosis and that agree with other authors (9,26-29). One reason for this effect is due to the influence of corticosteroids on the level of hydroxyproline, which contributes to the formation of collagen fiber, where he works on the lower level of hydroxyproline and this decline leads to weakness site the anastomosis and thus has a negative effect on the bursting pressure This agree with other authors (30,31). When he proved that level hydroxyproline is low in the steroidal group comparison with the control group. The changes in hydroxyproline content reflect the changes in the amount of collagen (28,32). When measuring the strength of the bursting pressure did not leak or rupture in the site of anastomosis in inverted group, but the rupture was happening away from the site of the anastomosis, in the intact part of the intestines and this result confirms that the anastomosis in this technique will be a force of intact parts of the intestines this agree with (13).

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