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Complications after two suture patterns of the jejunal anastomosis in donkey

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Abstract
The aim of the present study was to compare two suture patterns used for intestinal anastomosis in terms of their effect on white blood cells (WBCS) count, surgical site infection and mortality rate. Twelve apparently healthy donkeys were used. Animals were divided into two equal groups each of six animals. Two rows serosubmucosal continuous Lambert suture (SSCLS) patterns were performed in the first group while the second group underwent one row serosubmucosal interrupted suture (SSIS) pattern. White blood cell count was measured zero time, 24hr, 48hr and 72hr for determination of changes in the total white blood cell count. Also surgical site infection was observed at surgical site to detect abscesses or inflammatory exudates and mortality rate in each group over four weeks period after surgery. A significant rise (P value $\leq$ 0.05) was occurred in total white cells count at 48 hours post jejunal anastomosis in SSIS group compared with SSCLS group. Observation at surgical site examination revealed that the surgical site infection showed 50% in SSCLS group versus 66.7% in SSIS group while the mortality rates were found to be 33.3% and 16.7% in SSIS and SSCLS groups respectively. on conclusion, the two rows sero-submucosal continuous Lembert suture (SSCLS)group was found to be superior than the one row sero-submucosal interrupted suture (SSIS) pattern for jejunum anastomosis in donkeys, thus, being safe, reliably and can be performed as a technique for intestinal anastomosis in donkey.

Keywords: donkeys, anastomosis, surgical site infection, mortality rate

Introduction
Intestinal anastomosis is one of the most commonly performed surgical procedures, especially in the emergency cases and is also commonly performed in the elective surgery when resection are carried out for benign or cancer lesions of the small and large intestine. Surgical site infection after gastrointestinal anastomosis is one of the important postoperative complications that lead to significant morbidity and mortality (El-Badawy, 2014) [6]. Many researchers have described suture patterns and suture materials that used for anastomosis of the small intestine in horse (Reid *et al*., 1998) [12]. The anastomotic technique is an important factor of successful anastomosis healing (Al-Timmemi *et al*, 2010) [1].
Several studies and meta-analyses have compared the effectiveness of the single layer technique versus the double layer technique for gastrointestinal anastomosis (Baumann *et al*., 2018) [3]. The most significant complication after gastrointestinal anastomosis is an anastomatic dehiscence at any level along the gastrointestinal tract, followed by a stricture or a sepsis developing due to the failure of the gastrointestinal anastomosis. The results of several studies indicate that the incidences of anastomatic dehiscence, preoperative complication rate and mortality are comparable between the two suture techniques (Baumann *et al*., 2018) [3]. This study is an attempt to compare the efficacy of the two rows sero-submucosal continuous lembert suture and one row serosubmucosal interrupted suture (SSIS) pattern for jejnual anastomosis in terms of changes in total white blood cells count, surgical site infection and mortality rate.

Materials and Methods
Experimental animals
A total number of twelve clinically sound donkeys (3 females and 9 males) of different local breeds, 7±4.1 years of age, and weighing 93±7.8 kg were used. Individuals in each group were allowed to adapt to their surroundings for minimum of 3 weeks before surgery was carried out. The animals were dewormed with anthelimentic 2 weeks before commence of the experiment. Using mineral oil, tetanus antitoxin and Amoxicillin were used immediately before who commencement operation. All animals were deprived of food for overnight, while free access to water was allowed.

Surgical procedure
A left flank incision laparotomy approach using Ketamine hydrochloride/xaylzine anaesthesia. The jejunum was exteriorized and 15±2 cm long with the same diameter was removed. End-to-end anastomosis using 2-0 polyglycolic acid (Surgicryl PGA; Ethicon, UK) with two rows sero-submucosal continuous Lembert suture (SSCLS) patterns was performed in the first group (SSCLS group) to anastomose the resected segments of intestine, while one row sero-submucosal interrupted suture (SSIS) pattern was used in the second group (SSIS group). Then donkeys were under postoperative care observations. First day after operation the animals were allowed to have small amount of water, at the third day they were let to graze freely.

White Blood Cells Count (WBCs)
Blood samples were collected from jugular vein using 10ml

syringes before surgery as zero time and then at 24, 48, and 72 hours intervals after anastomosis of jejunum in the two groups of animals and transferred into tubes coated 2.5ml were mixed with EDTA in plastic containers for haematological indices. Total white blood cells count (WBCs) was carried out using Auto Haematology Analyzer BC-2800 Mindray, Hamburg- Germany (Figure 1).

Surgical site infection

The surgical site infection was defined as discharge of serosanguineous or frank pus from the wound site daily after surgery throw four weeks (Pathak *et al*., 2014) [10].

Mortality Rate

During four weeks in hospital mortality was taken into account daily after surgery from end to experiment (Rahul *et al*., 2015) [11].

Fig 1: Auto Haematology Analyzer BC

Statistical analysis

Computer program statistical package for social science (SPSS) version 16 was used for data analysis, Student's t-test was used to compare the results and $p \leq 0.05$ was considered to be statistically significant and results were presented as percentage (%) and mean ± standard deviation (M±SD).

Results

Total White Blood Cell (TWBCs) Count

As shown in Table (1) white blood cells count ($x10^9$ /l) was recorded prior to operation as baseline values and then 24, 48 and 72 hours following jejunal anastomosis, A significant increase (P value ≤ 0.05) was occurred in white cells at 48 hours post jejunal anastomosis in SSIS group compared with SSCLS group.

The surgical site infection

The surgical site infection at incision site was presented as percentage (%) as shown in figure (2).

The mortality rate

The mortality rate was considered as percentage (%) that calculated from the total number of each group; it found that the mortality rates were 33.3 and 16.7% in SSIS and SSCLS groups respectively figure (2).

Table 1: Effect of two different suture patterns (SSCLS and SSIS) used for jejunal anastomosis on white blood Cell (×109/l), M±SD at intervals 0, 24, 48 and 72 hours in donkeys.

Techniques	0 day	24hr	48hr	72hr
SSCLS	9.48±2.43	7.16±3.60	9.58±3.91[a]	10.62±3.35
SSIS	8.83±1.90	9.82±2.08	14.06±1.39[b]	12.32±1.76
Sig	N. S	N. S	*	N. S

n = 12
(SSCLS): Two rows sero-submucosal continuous lembert sutures.
(SSIS): One row sero-submucosal interrupted suture.
0 day: Base line values
Sig: Significance
N. S= Non significant
*= Significant at ($P \leq 0.05$)
Different letters in the same column indicate significant difference ($P \leq 0.05$).

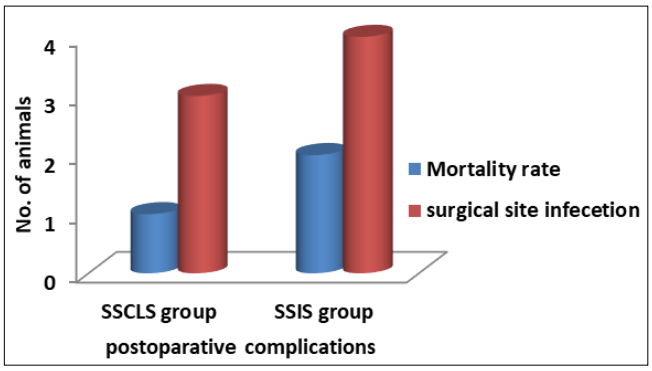

Fig 2: The Percentage (%) of Mortality rates and surgical site infection, for jejunal anastomosis using two rows sero-submucosal continuous lembert sutures (SSCLS) and one row sero-submucosal interrupted suture (SSIS) in donkeys.

Discussion

The aim of the intestinal anastomosis is to remove an irreversible injury, cancer or abnormal segment of the intestine, and reconnection of the opened bowel ends in a manner that would optimize healing and restore luminal and mural integrity. Manual intestinal anastomosis had been practiced, and it is still considered an option of intestinal anastomosis (Al-Timmemi *et al*, 2010) [1]. The anastomotic leakage, stenosis degree, diverticular formation and ultimately faecal fistula with serious septic complication leading to death after anastomosis were common consequences. However, the utility of any method of intestinal anastomosis depends upon safety, as well as anastomotic leakage at anastomotic site and luminal narrowing.

Many researchers preferred double row method as being the method of choice, however many reports had advocated the use of single row anastomosis because of lower rate of leakage, time consumption and cost effectiveness (Askarpour, *et al*., 2010) [2].

White blood cells count (WBCs) showed a significant rise at 48 hours post jejunal anastomosis in SSIS group compared with SSCLS group. This may be due to reactive leucocytosis and stress associated with the surgery (Mohammad *et al*., 2008) [9], these results are strongley suported by findings of Dilawer *et al*. (2011) [5], who reported increasing in white blood cells count after intra-abdominal surgery, Salciccia *et al*. (2013) [13], who reported that kinetics of blood leukocytes in survivors is higher than in non-survivors horses after colic surgery, however, Holmer *et al*. (2014) [7], who reported that leukocyte counts

were decreased with a marked left shift in the differential counts following surgery in rats.

The percentage of surgical site infection in SSCLS group and SSIS group were 50 and 66.7 % respectively. Other authors confirmed that the incidence of surgical site infection was occurred on the anastomatic site in man (Shah *et al*., 2015., Pathak *et al*., 2014) [14, 10] reported that surgical site infection at the anastomatic site was more observed in a single row compared with that reconnected using double row patterns, though surgical site infection is more common complication in SSIS group, on the other hand the results were consistent with the finding of Loesch *et al*. (2002) [8], reported that the some horses developed incisional infections and soft fluctuant swelling at the incision site following jejunoileal anastomosis with double layers simple continuous technique, while Rahul *et al*. (2015) [11] reported similar results of surgical site infection in single row compared with double row intestinal anastomosis in human beings. However, there were no surgical site infections in oesophagus anastomosis compared with large bowel anastomosis (De Almeida *et al*., 1983) [4].

The present study revealed that the mortality rate reported only in one animal (16.7%) in SSCLS group and two animals (33.3%) in SSIS group. This finding agree with Pathak *et al*. (2014) [10] reported that uncontrolled sepsis caused animal death that observed occurred in one patient underwent single row anastomosis techniques in human beings, although Rahul *et al*. (2015) [11] found similar results of mortality rate in both single row and double rows intestinal anastomosis in human beings.

It could be concluded that the two rows sero-submucosal continuous lembert suture (SSCLS) group was found to be superior than the one sero-submucosal interrupted suture (SSIS) pattern, thus, being safe, reliable and can be performed as a technique for small intestinal anastomosis in donkeys.

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