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ORIGINAL ARTICLE

STAPLED VERSUS HAND-SEWN ANASTOMOSIS OF THE LARGE BOWEL DUE TO ABDOMINAL TRAUMA: A PROSPECTIVE COMPARATIVE STUDY

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Aim: *To compare stapled with hand-sewn anastomosis in cases of large bowel injuries after abdominal trauma.*
Methods: *This prospective study was done in The Department of General Surgery, Minia University Hospital in a period between March 2004 and March 2007. All patients with colonic injuries requiring urgent resection due to abdominal trauma were included.*
Results: *There were 39 patients enrolled in this study, comprising 18 patients (46.2%) with stapled anastomosis and 21 patients (53.82%) with hand-sewn anastomosis. They were 30 males (76.9%) and 9 females (23.1%), with a mean age of 46.7±11.3 years. There were 3 patients (16.6%) of anastomotic leak in the stapled group versus 8 patients (38%) in the hand-sewn group (P<0.05).*
The operative time was 112 ± 30.2 min in the stapled group versus 160 ± 27.4 min in the hand-sewn group(P<0.05). The mean ± SD of hospital stay was 9.2 ± 8.3 days in the stapled group versus18.9 ± 14.5 days in the hand-sewn group(<0.05).
Conclusion: *Stapled large bowel anastomosis is safe and effective in setting of abdominal trauma. It is associated with fewer anastomotic leaks, lesser operative time and shorter hospital stay than hand-sewn anastomosis.*

Keywords: *Colonic injuries, stapler suture, manual anastomosis.*

INTRODUCTION

The interest in the results from comparisons between hand-sewn and stapling anastomosis has been progressively growing.[1] The stapled anastomosis following elective colon resection have been shown to be as safe as hand-sewn anastomosis.[2] In addition less time is required for stapled anastomosis than for conventional hand-sewn anastomosis, and the rate of complications after stapling are low.[3] However, there have been concerns that in trauma patients, gastrointestinal-stapled anastomosis might be associated with an increased risk of anastomotic leaks and intra-abdominal sepsis.[4] In addition, there were many points are not delineated as whether one or two-layered hand-sewn techniques were performed and if the defect for introduction of stapler was closed with a stapling device or sutures.[5] Thus, we conducted a prospective study to compare stapled with hand-sewn anastomosis in cases of colon injuries after abdominal trauma as regard the anastomotic leak, operative time, hospital stay and morbidity.

PATIENTS AND METHODS

This prospective study was done in The Department of General Surgery, Minia University Hospital in a period between March 2004 and March 2007. All patients with colonic injuries requiring urgent resection due to abdominal trauma were included in the study. All patients with elective anastomoses were excluded. A written

informed consent was taken from all patients. The preoperative assessment consisted of recording the following parameters: demographic data, clinical data and laboratory investigations. Antibiotic prophylaxis was based on an intravenous dose of 1 gm cefotaxime and 500 mg metronidazole intravenously with the induction of anesthesia, and then every 12 hours for 4 days. The patient was put in the Lloyd Davis position and a urethral catheter was inserted after anesthesia had been induced. Sealed envelopes were used for randomization during the operation after resection, and only if both stapled or hand sewn anastomosis could be done. The patients were randomly divided into two groups; stapled group and hand-sewn group. All stapled anastomoses were performed using linear or circular stapler (Ethicon Cincinnati, OH, USA). The proximal and distal ends of the bowel are prepared and approximated for anastomosis. Differences at the bowel ends were adjusted. The enterotomy remaining after withdrawal of the stapler was closed with a stapling instrument. Colorectal anastomoses were done by the use of circular stapler. All hand-sewn anastomoses were constructed as a single layer using 3 (0) polyglycolic suture that began at the mesenteric border. All layers of the bowel wall except the mucosa were incorporated. Each bite included 4 to 6 mm of the seromuscular wall; the larger bites were used at the mesenteric border to ensure an adequate seal. Each stitch was advanced approximately 5 mm. To avoid ischemia of the anastomosis, the surgeon had to ensure that only enough pressure was applied to the suture while following to approximate the ends of the bowel and render the anastomosis watertight. Patency of the anastomosis is tested intraoperatively. Proximal protective colostomy was done in colonic anastomoses of the left side of colon. An abdominal drain was inserted in all patients. The operative time was defined as the time from skin incision until skin closure. Anastomotic time was defined as time required for performing the anastomosis. A clinical leak was defined as an anastomotic dehiscence verified by reoperation, the development of an enterocutaneous fistula. Infective complications were recorded. The following data were recorded: the overall clinical anastomotic leak, anastomotic time, intra-abdominal sepsis, wound infection, operative mortality, length of hospital stay and length of intensive care unit (ICU)stay.

Patients with peritonitis after leak were managed by resuscitation followed by laparotomy with peritoneal lavage, creation of a defunctioning stoma and washout of the distal colon. Follow up was done every 4 weeks for 3 months and every 3 months for one year. Colonoscopy was done after 1 year to evaluate for the stricture formation.

Statistical analysis: All collected data were tabulated. Numerical data expressed as mean ± standard deviation, and categorical data were expressed as number and percent (%). T-student test was used to compare numerical data, and Chi-square test was used to compare categorical data. P value was considered to be significant if it was <0.05.

RESULTS

There were 39 patients enrolled in this prospective study, comprising 18 patients (46.2%) with stapled anastomoses and 21 patients (53.8%) with hand-sewn anastomoses. They were 30 males (76.9%) and 9 females (23.1%), with mean age of 46.7±11.3 years. The patient characteristics were similar in the two groups as shown in Table 1. The distribution of anastomosis in the different bowel segments was shown in Table 2.

Among the 39 randomized cases, there were 11 anastomotic leaks (28.2%); 3 patients (16.6%) in the stapled group versus 8 patients (38%) in the hand-sewn group (P<0.05), Table 3.

The operative time was 112 ± 30.2 min in the stapled group versus160 ± 27.4 min in the hand-sewn group. This was of significant difference (P<0.05). The anastomotic time was 15±12 min in the stapled group versus 30±6.3 min in the hand-sewn group (P<0.05). The mean blood loss was 860±325 ml in the stapled group versus 850±320 ml in the hand-sewn group (P>0.05). Intra-abdominal abscess was diagnosed in 12 patients (30.7%); 5 patients (27.7%) in the stapled group versus 7 patients (33.3%) in the hand-sewn group (P>0.05). Percutaneous drainage was successful in all except one in each group who needed open drainage. Wound dehiscence was detected in 9 patients (23.1 %); 4 patients (22.2%) in stapled group versus 5 patients (23.8 %) in the hand-sewn group (P>0.05). Wound infection was detected in 14 patients (35.8%); 6 patients (33.3%) in the stapled group versus 8 patients (38%) in the hand-sewn group (P>0.05). There were 4 deaths; two in each group were directly caused by anastomotic dehiscence and septic shock (P >0.05). The mean ± SD of ICU stay was 2.9 ± 4.3 days in the stapled group versus 6.8 ± 4.6 days in the hand-sewn group (P <0.05). The mean ± SD of hospital stay was 9.2 ± 8.3 days in the stapled group versus 18.9 ± 14.5 days in the hand-sewn group (P <0.05). At the end of the first year, 28 patients (71.7 %) were available for colonoscopy to detect stricture formation. Nine of 28 patients (32.14%) developed stricture. Seven patients (38.8%) were in stapled group versus 2 patients (9.5%) in hand-sewn group (P <0.05). However, all patients are asymptomatic except one patient in the stapled group who needed endoscopic balloon dilation with successful outcome.

Table 1. Characteristics of the included patients.

Variable	Hand-sewn group (21)	Stapled group (18)	P value
Mean age (y)	46.3 ± 10.2	46.8± 9.8	>0.05
Gender (Female/Male)	5/16	4/14	>0.05
Mean weight (kg)	69.4 ± 11.8	68.5± 9.8	>0.05
Mean Hemoglobin (g/dl)	11.6 ± 4.3	11.2± 5.2	>0.05
Mean WBC count (/cc)	15.24 ± 3.5	14.9±4.3	>0.05
Mean albumin (gm/dl)	3.5 ± 1.4	3.5 ± 0.9	>0.05
Mechanism of trauma:			
Blunt	5	4	>0.05
Penetrating	9	8	>0.05
Gunshots	7	6	>0.05

WBC, white blood cells count.

Table 2. Sites of anastomosis.

Anastomotic site	Hand-sewn group (%)	Stapled group (%)	P value
Right colon	6 (28.5)	5 (27.7)	>0.05
Transverse colon	1 (4.7)	1 (5.5)	>0.05
Left colon	5 (23.8)	5 (27.7)	>0.05
Sigmoid colon	4 (19)	3 (16.6)	>0.05
Colorectal	5 (23.8)	4 (22.2)	>0.05

Table 3. The outcome data of included patients.

Outcome	Hand-sewn group (21)	Stapled group (18)	P value
Anastomotic leakage (%)	8 (38)	3 (16.6)	< 0.05
Mean operative time (min)	160±27.4	112±30.2	< 0.05
Mean blood loss (ml)	850±320	860±325	>0.05
Wound dehiscence (%)	23.8	22.2	>0.05
Wound infection (%)	38	33.3	>0.05
Intra-abdominal abscess (%)	33.3	27.7	>0.05
Mortality rate (%)	9.5	11.1	>0.05
Mean length of hospital stay(day)	18.9±14.5	9.2±8.3	< 0.05
Mean length of ICU stay(day)	6.8±4.6	2.9±4.3	< 0.05

ICU, intensive care unit.

DISCUSSION

Two common methods to construct an anastomosis are the use of stapler or suturing. Stapling devices have been in use since the late 1970's. A linear stapler places two double rows of staples and divides the tissue between the two lines of staples at the same time. However, there is no consensus as to the superiority of stapling over hand-sewn methods for anastomoses for emergency cases. The areas of contention regarding outcome include leak rate, stricture, and speed of anastomosis formation.[6] Contrast radiography is used in many studies to determine the true rate of leakage, as many leaks are not manifested clinically. Stapled anastomoses are generally thought to have a lower rate of leakage both clinically and radiologically.[7] Conversely, some reports argued that overall leak rate is similar with hand-sewn anastomosis.[8] In the present study, there was a significant low leakage rate in stapled group versus the hand-sewn group. Possible reason is the decreased rate of local spillage with stapled anastomosis. In addition, the uniform closure of all staples may also be important. However, we had a high leak rate in both groups due to delayed referral of patients to our hospital.

Some studies[9,10] have shown that women have a lower incidence of anastomotic leak compared with men but other studies did not comment on the contribution of gender distribution to the anastomotic leak rates. In the present study, there was no significant difference as regard the anastomotic leak in relation to the gender.

Demetriades[11] did speculate however that a significantly lower rate of intra-operative septic spillage in the stapled group was a theoretical advantage of the functional end-to-end stapling technique. Stapled anastomosis led to less tissue trauma and decreased chances of peritoneal contamination.[12] In our study, the intra-abdominal septic complications are similar in both groups which may be explained by the routine use of intra-peritoneal lavage and routine use of drains. Intra-operative septic conditions have been shown to be a risk factor for clinically significant anastomotic leak.[13] Only one study performed routine post-operative gastrografin enema, which picked up asymptomatic radiological leaks.[14] In the present study, radiology was used to confirm clinical suspicion of anastomotic leak. Considering all the clinically apparent anastomotic leaks, there was a non-significant trend towards fewer leaks in the stapled group (P=0.06).[10] The asymptomatic leaks detected by radiology might however have clinical sequel as a recent study found.[9]

Anastomotic time theoretically should be shorter with stapled anastomosis.[15]

Both Didolkar[16] & Ikeuchi[17] included anastomotic time with other anastomoses and both found stapled anastomoses slightly faster to perform. However it does not always translate into shorter operation time.[18] The operating time with suturing was dependent on the type of sutures; for example, single sutures are quicker to insert than double sutures. In our study, one-layer sutures were used and still there was a significant short operative time in stapled group versus the hand-sewn group. The short operative time is advantageous in those patients who were critically ill to minimize the risk of prolonged operative time.

Stapling devices require familiarity with the instruments and are associated with a higher rate of technical mishap in the operating room.[19] In our study, the surgeons were familiar with the stapled instruments due to its common use in elective anastomosis. Stapled devices are more expensive than sutures[20] and this cost is not compensated by reduced hospital stay.[21-22] In the presnt study, the cost analysis was not done. However, the stapled anastomosis was associated with shorter hospital stay in comparison with hand-sewn anastomosis.

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