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Incidence Rate & Risk Factors of Anastomotic Leakage after Gastrointestinal Surgeries in Al Matariya Teaching Hospital

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Abstract: Background: Intestinal anastomosis is one of the most commonly performed surgical procedures, both in the emergency and elective settings. Anastomotic leak after gastrointestinal anastomosis is one of the important postoperative complication that leads to significant morbidity, length of hospital stay and unfortunately mortality. **Objective:** To define the incidence & risk factors of anastomotic leakage in Al Matariya Teaching Hospital as an example of tertiary care centres in Egypt. **Methods:** Retrospective data collection regarding patients who underwent small or large bowel resection and anastomosis without fecal diversion in the surgical department in Al Matariya Teaching Hospital in the period between July 2017 and January 2019. Demographic details of the patients as well as preoperative, intraoperative and postoperative data were recorded. Leak found or not and on which postoperative day leak found. How it was identified (clinical or radiological) and how it was managed. Outcome of patients was recorded. **Results:** There were 33 male (64.7%) and 18 female (35.3%) patients. Age ranged from 16 to 65 years, with a median of 40.5 years. Anastomotic leak was occurred in 13 patients (25.4 %), while there was no leak in 38 patients (74.5%). The mean postoperative period for diagnosis of anastomotic leakage was 9 days range (5-16) days. Certain factors associated with occurrence of leak seemed to be significant in this study ($P<0.05$) such as: preoperative anemia, hypoalbuminemia, emergent conditions without adequate bowel preparation, intraoperative hypotension, and postoperative ICU. Other factors were not significant in our study for their impact on the anastomotic leak ($P>0.05$) they include gender and age of the patients, previous medical history, level of anastomosis, underlying pathology and intraoperative blood transfusion. Mortality rate was (23.1%) 3/13 in group I, while it was (2.6%) 1/38 in group II. **Conclusion:** Postoperative gastrointestinal anastomotic leak is a very serious complication that has great clinical impact on patients. There is multiple risk and predictive factors associated with occurrence of leak were suspected in this study such as: preoperative anemia, hypoalbuminemia, surgery performed in an emergency setting, without adequate bowel preparation, intraoperative blood loss and hypotension. Many other factors remain unclear. Death after leak is most often a substitute for a critically ill patients and was infrequently the actual cause of deaths.

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Key Words: Anastomotic leakage, gastrointestinal surgery, risk factors.

1. Introduction

Intestinal anastomosis is one of the most commonly performed surgical procedures, especially in the emergency setting.[1] Leakage from an anastomosis in the gastrointestinal tract that is often associated with increased morbidity, mortality rate[2] and adversely affect length of hospital stay and cost.[3]

The cause of the leakage may be multifactorial, including contribution from faulty technique, ischemia of the intestine at the suture line, excessive tension across anastomosis and mesentery, the presence of local sepsis, presence of obstruction distal to the anastomosis.

The old patients, anemia, malnourished with several coexisting diseases, receiving high doses steroids, after chemo-radio-therapy is more prone to develop the anastomotic leakage.[4] Among other factors are male gender, smoking, obesity, alcohol abuse, long duration of operation, preoperative blood transfusion and timing during duty hours.[5]

The frequency and consequences of anastomotic failure vary according to the site within the gastrointestinal tract. Anastomotic leak rates following colorectal anastomosis range from 4 to 26%.[6] Surgeons are all familiar with potentially devastating consequences of an anastomotic leak. Patients classically develop agonizing abdominal pain, tachycardia, high fever and a rigid abdomen, often accompanied by hemodynamic instability. In these cases urgent return to the operating room for

peritoneal washout and fecal diversion is generally required.[7] The mortality rate for an anastomotic leak in the literature typically is in the 6 to 39% range and a 10- 100% rise of permanent stoma.[8] However, a large number of patients ultimately found to have an anastomotic leak develop a more insidious presentation, often low grade fever, prolonged ileus, or failure to thrive.[9] In these patients making the diagnosis may be much more difficult as the clinical course is often similar to other postoperative infectious complications. These patients are often discharged from the hospital without the correct diagnosis in the present environment of cost containment as their nonspecific symptoms (eg. poor appetite, failure to thrive) are not enough to (justify) continued hospitalization. Radiological imaging is usually required even then, the diagnosis may be elusive or at least uncertain.[7]

So, the aim of this retrospective study is to define the incidence rate, risk factors, presentation and outcome of anastomotic leakage after gastrointestinal anastomosis.

Study design:

Medical records from July 2017- January 2019 were studied. 51 consecutive patients underwent small or large bowel resection and anastomosis without fecal diversion. The patients were divided postoperatively into 2 groups: those with clinical anastomotic leakage confirmed by laparotomy or radiologically (group 1) and those without anastomotic leakage (group II). Preoperative, operative and postoperative clinical and biological findings were compared between the two groups.

Inclusion criteria:

All adult patients presented to Al-Matariya Teaching Hospital Surgical Department who had a small or large bowel resection or bypass with anastomosis whether for; trauma or disease, electively or emergently, open or laparoscopic.

Exclusion criteria:

1. Patients younger than 12ys old.
2. Patient previously explored in another institution.
3. History of previous intestinal surgery.
4. Primary stoma procedures.
5. Patients with anastomoses involving the stomach or biliary tract and feeding jejunostomies.
6. Patients who died in the first 48 hours postoperative.
7. Patients with other gastrointestinal injuries e.g. splenic injury, liver injury.
8. Patients with coagulation disorders.
9. Patients who underwent anastomosis for bariatric surgery.

2. Methods

Medical records of 51 patients who had undergone anastomosis at various levels in the gastrointestinal tract in the surgical department in Al-Matariya Teaching Hospital in the period from July 2017 to January 2019 were reviewed. To be eligible for this study, all adult patients having a small or large bowel resection and anastomosis either elective or emergency, open or laparoscopic without temporary diverting stoma and patients need bypass for unresectable diseased bowel.

The preoperative and operative database include: age, sex, major medical conditions, previous major surgery, preoperative hemoglobin, albumin, and bowel preparation. Whether the patients were operated upon in an emergency or elective setting were noted, operative time, blood loss during surgery, intraoperative blood transfusion, surgical technique [laparoscopic or open], anastomotic technique [hand-sewn, stapled] and anastomotic segment. After surgery, patients were followed up daily in the hospital until discharge. The patients were divided postoperatively into two groups: those with clinical evidence of anastomotic leakage confirmed by laparotomy or radiology (group I) n= 13 and those without anastomotic leakage (group II) n= 38.

The definition of anastomotic leakage in the present study was; leakage of bowel content and or gas, pus from the drain or through the wound (fig.1). Pelvic abscess, peritonitis or discharge of pus per rectum, postoperative pyrexia or septicemia with abdominal tenderness without any evidence of source of infection.

All the clinical leakage cases were confirmed by imaging technique, a water-soluble contrast enema or CT scan study. Asymptomatic radiological anastomotic leakage was not considered because routine CT or enema was not performed after surgery. The following postoperative clinical and biological findings were recorded: fever, transient disturbances (absence of bowel movement, postoperative ileus and diarrhea), fluid collection by nasogastric aspiration and abdominal drainage, leak found or not and on which postoperative day leak found. How it was identified (clinical or radiological) and how it was treated, mortality rate and hospital stay were also recorded. After discharge the patients were followed weekly for the first month and monthly for 6 months postoperatively.

Statistical analysis

The statistical analysis of data was done by using spss program [statistical package for social science version 16] on windows 7 and Microsoft excel 2010.

Data was expressed as follows:

1- Frequency and proportion for qualitative data.

2- Mean ± SD for normally distributed quantitative data.

The analysis of data was done to test statistical significance between different groups.

1- For qualitative data [frequency & proportion] chi-square test was used.

2- For quantitative data normally distributed (mean ± SD), unpaired Student's t test was used to compare the means of different groups.

P. value is significant if ≤ 0.05 at confidence interval of 95%. P. value ≥ 0.01 highly significant.

3. Results

The medical records of 51 patients who met our inclusion criteria during the study period were reviewed. There were 33 (64.7%) males and 18 (35.2%) female patients. Age ranged from 16 to 65 years, with a median of 40.5 years. Of the 51 patients, a total of 30 patients had Small bowel anastomosis (58.824%), 14 had Large bowel anastomosis (27.451%) and 7 had Ileo-colic (13.725%) end to end anastomoses.

2 (3.9%) patients were diabetic, 13 (25.49%) were smokers, 3 (5.8%) patients were tested positive for Hepatitis C virus and 1 (1.9%) patient had chronic renal failure. Table (1).

Figure 1: leakage of bowel content though the wound

Figure 2: axial CT of the upper part of the abdomen showing a large collection with a fluid level (white arrow) containing contrast material adjacent to the staple line

Table 1 Demographic Data & Medical history

Sex	**No.**	**%**
male	33	64.7
female	18	35.2
Age		
16-25	14	27
26-35	10	19.6
36-50	15	29.4
51-65	12	23.5
Smoking	13	25.49%
Medical diseases		
D.M	2	3.9
CRF	1	1.9
HCV	3	5.8

Type of surgery was elective in 33 (64.7%) patients and emergency in 18 (35.2%) patients. No bowel preparation was done on those patients operated on an emergency basis (fig.3). Surgical technique: was open in 39 (76.47%) patients, laparoscopic in 9 (17.64%) patients and converted in 3 (5.8%) patients.

The operative blood loss range (300- 1400 mL) mean ± SD was (342.93 ± 85.83). The volume of blood transfusion range (1-4unit) mean ± SD was (3.87 ± 0.91). Nasogastric decompression, urinary catheter and drain placement were done routinely in all patients.

Anastomotic leakage was occurred in 13 of 51 patients (25.4%) group I, no anastomotic leakage was found in 38 patients (74.5%) group II. On postoperative day 3 significantly more patients in group I had fever above 38°C than in group II 6/13 (47.06%) versus 7/38 (13.98%). More in group I patients than in group II patients also had transient disturbances, they included the absence of bowel movement on postoperative day 4 and diarrhea before postoperative day 6. From postoperative day 2 to 4, amount of drainage fluid exceeding 500ml were collected significantly more from group I patients than group II patients 7/13 (52.74%) versus 5/38 (13%). No significant difference was noted between the two groups for nasogastric fluid aspiration on 3rd postoperative day.

The mean postoperative period for diagnosis of anastomotic leakage was 9 days range (5- 16 days). In 5 patients, it was identified by drain output and 3 patients were clinically diagnosed at a mean of 8 days (5-12 days) postoperatively. The remaining 5 patients were diagnosed radiologically at a mean 16 day's postoperatively. Contrast enema was obtained in 3 cases, the leak was observed in one case, but in 2 cases the test was falsely negative. CT scan was obtained in 4 cases, the leak was correctly diagnosed in 3 cases, but one scan was falsely negative (fig.2).

Out of the 13 patients of group I with anastomotic leakage, **6 patients** required fecal diversion after another exploratory laparotomy and washout of peritoneal cavity and repair of the leak. One of those re-operated patients died 3 days later. **3 patients** were able to be managed non-operatively (typically with radiologic drainage and antibiotics). **2 patients** had conservative management of the leak done and **2 patients** died before reoperation and anastomotic leakage was confirmed by (autopsy).

Categorical variable found to be significantly affecting the outcome of anastomosis were smoker versus nonsmoker ($P < 0.0001$), type of surgery elective versus emergency ($P < 0.05$), preoperative anemia & hypoalbuminemia. Bowel preparation done in 33 patients versus not done in 13 patients ($P < 0.05$). Also, intraoperative blood loss & hypotension ($P < 0.0001$) were highly significant. Certain factors were not significant in our study for their impact on the anastomotic leak, they included: gender & age of the patients, diabetes mellitus, HCV ($P > 0.05$). Surgical technique, type of anastomosis, drain placement, & nasogastric decompression ($P > 0.05$).

The overall mortality rate was 30.7% that was significantly increased in patients with AL, as we had 4 cases of mortality, 3 (23.076%) of them had AL and died in the postoperative period due to sepsis related multiorgan failure following anastomotic dehiscence.

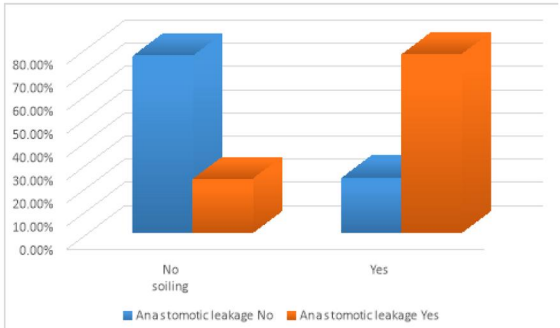

Figure 3: Association of AL with intraoperative soiling

4. Discussion

Anastomotic leakage is the most serious complication specific to intestinal surgery and range from 2.9% to as high as 15.3%.[10] However, there is lack of a clear definition for what constitutes an anastomotic leak [radiological proven, clinically relevant, with or without abscess].[11] But the criteria of anastomotic leakage in our study was leakage of bowel content and or gas or pus from the drain or through the wound, pelvic abscess, peritonitis or discharge of pus per rectum, postoperative pyrexia or septicemia with abdominal tenderness without any evidence of source of infection.

Numerous risk factors have been implicated as predisposing for anastomotic leaks. Factors that were found to correlate with an increased leakage rate were older age, anemia, prior radiation therapy, intraperitoneal infection and anatomic level of anastomosis.[12]

Among patient related factors, male gender is generally accepted as a risk for anastomotic leakage.[14,15] Some recent studies showed that male patients, have a high risk of complications in open and laparoscopic surgery[16] We also found there is increase of anastomotic leakage in male patients but were not of significance statistical value.

Systemic conditions were associated with increased risk of anastomotic leakage in our study are anemia and hypoalbuminemia ($P< 0.001$). However, many studies reveal that both prolonged and short-term malnutrition diminish anastomotic healing,[11,17] the mechanism through which malnutrition affect anastomotic healing is not fully understood and may be due to lack of essential amino acids for collagen synthesis or deterioration in the patients immuno-competence.[18]

Diabetes, ischemic heart disease and Hepatitis C virus are another causes of anastomotic leakage in this study, but it did not have statistical significance. Little evidence indicates that diabetes affects GI healing. A direct effect of the diabetic state of the healing process is difficult to separate from an impairment caused by

increased abscess formation.[19] Smoking was the independent risk factors associated with anastomotic leak in our study (P< 0.0001). We agree with Sultan et al.[3], Daams et al.[20], Trencheva et al.[21] who found that there is highly significant anastomotic leak in smoking patients. Smoking and alcohol abuse are important predictive factors for anastomotic leakage after colonic and rectal resections.[20,22] Type of surgery and bowel preparation were independent risk factors of anastomotic leakage in this study. We found that there is increase of anastomotic leak in patients who operated in emergency versus in elective cases and in patients who are not attending bowel preparation versus the prepared cases. Several well designed prospective randomized trials have shown that preoperative bowel cleaning does not prevent anastomotic leakage or wound infection in patients undergoing open or laparoscopic colorectal surgery,[14,24] however, some randomized trial have reported significant differences in outcomes with use of oral antibacterial agents and mechanical preparation. Irvin and Goligher[25] reported significant decrease in anastomotic dehiscence with use of mechanical preparation than that without mechanical bowel preparation.

Surgical technique, either open, laparoscopic, or converted were not associated with significant difference of anastomotic leakage in our study. Also, there is no significant difference in anastomotic leakage was noted between hand sewn and stapling procedures. A meta- analysis, concluded that there is no difference between hand-sewn and stapled anastomosis for the majority of outcome measures including mortality, leak rates, local cancer recurrences and wound infection.[33-36]

A highly statistically significant relation was found between intra operative blood loss, intra operative blood transfusion and anastomotic leak. (P< 0.0001) we agree with Kirchhof et al.[11] Kiran et al.,[40] about this point. Routine nasogastric decompression and abdominal drains in patients undergoing a procedure involving an intestinal anastomosis remain controversial. Abdominal drains and nasogastric tubes were routinely inserted in all patients in this study.

The mean postoperative period for diagnosis of anastomotic leakage was a 9 days range [5-16 days] in our study. Anastomotic leakage typically becomes clinically apparent between the 5th and 8th postoperative day, but many exceptions exist, with one study even reporting a mean of the 12th postoperative day for the diagnosis of anastomotic leakage.[7]

When facing and treating patients with anastomotic leak, surgeons have to take into account many different aspects i.e, age, health status and current clinical condition of the patient, extent of dehiscence, time between operation and reoperation, indication of primary resection and localization of the anastomosis. These variable lead to individualization of treatment strategies and in comparable outcome. However: few studies, showing that surgeons believe that the anastomosis can be repaired rather than dismantled, have paved the way for a trial in which next to mortality and morbidity, preservation of the anastomosis could be one of the endpoints.[20,57]

Conclusion

Postoperative gastrointestinal anastomotic leak is a very serious complication that has great clinical impact on patients, putting surgeons in dilemmas of detection and management. Multiple risk and predictive factors associated with occurrence of leak were suspected in this study such as: preoperative anemia, hypoalbuminemia, smoking, surgery performed in an emergency setting, without adequate bowel preparation, intraoperative blood loss and hypotension but many factors remain unclear. The presentation of anastomotic leakage varying from severe peritonitis and leakage of bowel content through the wound or from the drain to asymptomatic (small pelvic abscess). Early detection and expediently treatment is very helpful to improve the patients outcome but death after leak is most often a substitute for a critically ill patients and was infrequently the actual cause of death and so every effort needs to be made to bring down the mortality rates and hospital stay associated with anastomotic leak.

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