ORIGINAL RESEARCH

Prevalence of and factors associated with anastomotic leakage among surgical patients at 2 teaching hospitals in Addis Ababa, Ethiopia

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Abstract

Background
Gastrointestinal resection and anastomosis is a very common procedure globally. Anastomotic leak is a complication affecting 2% to 10% of patients undergoing gastrointestinal surgery. Different factors have been attributed to the development of leak. This study was designed to assess the prevalence and associated risk factors for anastomotic leakage in a period of three years at Tikur Anbessa Specialized Hospital (TASH) and Menilik II Memorial Hospital (MIIMH).

Methods
A retrospective data of 157 patients, for whom intestinal anastomosis was done from 2014 to 2016 at TASH and MIIH, were included in this study. Descriptive statistics were done to assess the prevalence and association of different factors with anastomotic leakage.

Results
Among the patients operated a total of 17 patients developed postoperative anastomotic leakage, which makes the prevalence rate 10.8%. There was a statistically significant association between emergency presentation, ASA class (≥3) and the need for intra-operative blood transfusion with the occurrence of anastomotic leakage.

Conclusions
The prevalence of anastomotic leakage in this study was 10.8% a bit higher from the usual range (2%-10%). Emergency presentation, those in need of blood transfusion and having higher ASA class were associated with anastomotic leakage.

Keywords: anastomotic leak, risk factors, prevalence, Ethiopia

Introduction

Anastomotic leak is one of the most dreaded complications of intestinal surgeries.

There is no uniformly accepted definition of anastomotic leak in the literature. In 1991, the United Kingdom Surgical Infection Study Group proposed the definition as a "leak of luminal contents from a surgical joint between two hollow viscera". These contents can exit through wound or drains, or collect at the anastomotic site. [1]

The majority of reports investigating the cause and rate of leaks use various clinical signs, biochemical markers and radiological parameters to define an anastomotic leak. The most detailed definition encompasses a combination of clinical indicators like pain, fever, tachycardia, peritonitis and biochemical markers; such as C-reactive protein, cytokines and radiologic studies showing fluid collections or gas-containing collections and intra-operative findings.[2–5]

The incidence of AL after colorectal surgery was reported as 1%-30% in several prospective, retrospective, and population-based cohort studies[6] Variability in the incidence of AL is related to the lack of consensus concerning the definition and diagnosis of AL. However, it is still a serious complication of colorectal surgery that reduces cancer-specific survival and causes 25% of postoperative mortality.[7–9]

There are also differing opinions as to what risk factors have been proved to predict anastomotic dehiscence. Different risk factors have been reported from different coun-

tries. In a study done in Pakistan in 2014; operation time, intra-operative blood loss, intra-operative blood transfusion, indication of surgery, malignancy, type of surgery elective/emergency, intra-operative use of vasopressor, site of bowel anastomosis, and drain placement were associated with anastomotic leak rate.[10] In a similar study done in Turkey in 2015; higher ASA class, emergency procedure and inexperienced surgeon were associated with higher AL rate.[11]

Anastomosis leakage leads to more severe postoperative complications, high rate of reoperations and higher mortality. [12]

In addition, development of a postoperative anastomotic leak negatively impacts oncologic outcome in patients undergoing curative resection for colorectal cancer.[13]. It also adversely affects length of hospital stay and cost of treatment [14–17]

Preoperative patient optimization such as correction of anemia, malnutrition and other chronic morbidities are critical to minimize the risk of anastomosis leak. Moreover, Identification of patients at increased risk for anastomotic leak is imperative to plan for selective proximal diversion.

Anastomosis leak is a relatively common observation in our hospitals however; data regarding the prevalence and associated factors is unavailable in Ethiopia. Hence studying prevalence and associated factors will enable us to assess the magnitude of the problem and devise mechanisms to address the issue. Moreover, it raises awareness of the ministry of Health to allocate adequate resources for future researches.

Methods

Retrospective review of patients who were operated over the past 3 years was done and data was retrieved based on predetermined variable list. The study setting was Addis Ababa University, College of health science, Tikur Anbesa specialized hospital and Menelik II Memorial Hospital.

Study Design and Period

Institutional based cross sectional study was done among adult patients for whom intestinal anastomosis done from January1, 2014 to December 30, 2017 at TASTH and MIIMH; located in Addis Ababa, Ethiopia

Study population

The study population included all adult patients for whom intestinal anastomosis done at TASTH and MIIMH during three year period. Patients with no operation note or anesthesia sheet or whose records were lost, are excluded from the study. A total of 224 patients were operated in the study period and 63 charts were missing and 4 of the charts had no operation note and/or Anesthesia note. Registration book of about 6 months period was missing in both hospitals. Therefore, of 224 patients, 157 were included in this study with a retrieval rate of 70.1%.

Study variables

The variables measured in this study were defined by reviewing relevant literature that have assessed anastomotic leak. In this study, age, sex, initial diagnosis, presentation, ASA class, amount of blood loss, intra-operative blood transfusion and serum albumin level were considered independent variables. Anastomotic leak and outcome of surgery were used as dependent variables.

Table 1. Frequency table of selected variables among patients underwent intestinal anastomosis at TASTH and MIIMH, Addis Ababa January1, 2014 to December 30, 2017

Variable		n	%
Sex	M	103	65.6
	F	54	34.4
Age	<20	6	3.8
	20 – 50	93	59.2
	>50	58	36.9
Presentation	Emergency	52	33
	Elective	105	67
Pathology	Mass	55	35
	Redundant sigmoid	47	30
	Adhesion	24	15
	Others	31	20
Site of pathology	Small bowel	50	32
	Large bowel	85	54
	Rectum	22	14
ASA Class	<3	140	89.2
	≥3	12	7.6
Albumin	<3.5	35	22.3
	>3.5	39	24.8
Blood Transfusion	Yes	23	15
	No	134	85
Leak	Yes	17	10.8
	No	140	89.2
Outcome	Dead	16	10.2
	Improved	141	89.8

Data collection techniques

The data were collected by reviewing patients' charts using a structured questionnaire. The questionnaire was prepared in English language to collect important information such as age, sex, diagnosis , presentation, American Society of Anesthesiologists class, blood loss , intra-operative blood transfusion ,serum albumin level, development of leak and when leak detected, if occurred, and outcome of surgery.

Patients for whom intestinal anastomosis done were ini-

Table 2. Association of selected variables with presence of leak among patients underwent intestinal anastomosis at TASTH and MIIMH, Addis Ababa January1, 2014 to December 30, 2017

Variable	P- value	AOR	95% C.I.	
			Lower	Upper
Blood transfusion	.001	4.3	1.81	10.3
Presentation	.043	.2.3	1.42	14.3
ASA class	.025	1.6	1.12	2.63

tially identified from operation theatre's logbooks of the hospitals and from which card numbers of the patients obtained. The Charts of the patients were retrieved from the hospitals' record room. Using the cards as reference, relevant information was collected by filling the questionnaire. Ethical clearance was obtained from ethical committee of the surgical department, school of medicine Addis Ababa University.

Data processing and analysis

After data is collected, it was entered in to SPSS 20 manually. The data was then analyzed for frequencies of occurrence. Then association of variables was evaluated by multinomial logistic regression. P value of 5% was used as cut off point for statistical significance. Confidence interval was set at 95% boundary.

Results

Charts of 157 patients were reviewed in this study. 65.4 %(103) of the patients were male and 36.6 %(54) of patients were female. Age categorization of cases showed that 59.2% were aged 20 to 50 year, 36.9% were above 50 year, and 3.8% of cases were below 20 year(14-19).

Small bowel was involved in 32% of cases; colon in 54% of the cases; and Rectum in 14%.

The primary indication for the surgical intervention was redundant sigmoid colon 30% (a diagnosis given for patients who are successfully treated by rectal tube deflation for a sigmoid volvulus) , tumor (35%), adhesion (15%); trauma, strictures, volvulus and inflammatory bowel disease accounted for (20%).

Sixty seven percent of cases were operated on an elective basis while 33% of cases as emergency.

89.2% of cases had ASA class < 3, and 7.6% had ASA class ≥ 3 at presentation. Serum albumin was more than 3.5 in 24.8% of cases. Blood was transfused for 15% of the cases.

Among157 patients operated a 17(10.8%) developed postoperative anastomotic leak.

Of those cases who developed AL, 11 (65%) died while 6(35%) discharged improved. Causes of death were multi-organ failure 4 (36.4%), respiratory failure 4 (36.4%), cardio respiratory failure 2 (18.2%) and sudden cardiac arrest 1(9%).

Site of anastomosis has no significant association to leak with small bowel 5(10%) and large bowel leak 12(11.2%) but mortality was higher in those who leaked after an anastomosis done in the rectum and small intestine. The leak rate of left colon and right colon is similar with 9(11.2%) and 3(11.1%) respectively.

Mortality after leak in those operated for gangrenous bowel obstruction was 100%. There was no AL rate difference between single layer vs. double layer anastomosis technique.

Of those who developed AL, 2 cases operated by consultants died while, the number of death was 9 for cases operated by senior surgical residents.

Nine of the twelve patients who died, AL were detected after the fifth postoperative day, while only 2 out of the five patients on whom AL was detected in the first five days died.

Sex, age, involved part of bowel, type of pathology and serum albumin level did not show statistically significant association.

In multivariate analysis of variables to see association between these factors and the occurrence of leak showed that mode of presentation, blood transfusion, and ASA class were associated to the degree of statistical significance. (Table 2)

Among patients who underwent surgery as emergency 18% developed anastomotic leak, in contrast to 7% anastomotic leak rate in elective ones (***P-value 0.043, AOR 2.3, CI 1.4-14.3***). Table 2

Table 3. Initial Diagnosis of cases developing Anastomosis leak after Intestinal anastomosis at TASTH and MIIMH, Addis Ababa January 1, 2014 to December 30, 2017

S. No.	Diagnosis	n	%
1	GI Malignancies	7	41%
2	Penetrating Abdominal Trauma	2	11.8%
3	Generalized Peritonitis 2° to Viscus perforation	2	11.8%
4	Redundant Sigmod colon	2	11.8%
5	Gangrenous LBO 2° to Gangrenous sigmoid volvulus	2	11.8%
6	Gangrenous SBO 2° to Ileal stricture	1	5.9%
7	Gangrenous SBO 2° to mesenteric cyst	1	5.9%

Table 4. Frequency of outcome in relation to the time of anastomosis leak among patients developing AL at TASTH and MIIMH, Addis Ababa January1, 2014 to December 30, 2017

S. No.	Postoperative day AL detected	Number of AL detected	% mortality	% of patients discharged with improved condition
1	≤ 5	5	40%	60%
2	>5	12	75%	25%

Those who had ASA class score ≥ 3 had higher rate of anastomotic leak than those with score < 3. Anastomotic leak was observed in 41.7% of patients who had ASA class ≥3, in contrast to only 7% of patients who developed leak in those with ASA class < 3 (***P-value 0.025, AOR 1.6, CI 1.1-2.6***). Likewise among those who got blood transfusion 31.7% of patients developed leak, in contrast to only 7.5% leak rate among non-transfused patients (***P-value 0.001, AOR 4.3, CI 1.8-10.3***).Table 2

Discussion

Knowledge of prevalence and associated factors for anastomotic leak after gastrointestinal anastomosis has paramount importance for prevention, early detection, and intervention.

The prevalence of anastomotic leak in this study is 10.8% which is slightly higher than the usually acceptable range 2% and 10%. [18–21]

In this study, prevalence is almost equal in both male and female.. This is true in most other studies; however some reported leak rate is more in male colonic and rectal cancer patients.[22,23]

According to this study, there is no difference among different age group. Studies showed AL can occur in any group but advanced age has been reported as a risk factor for AL in some studies. In contrast there are some reports of younger age as a risk factor for AL. [23,24]

Anastomotic leak was higher in patients operated on emergency (18%) basis than elective cases (7%). This is consistent with studies conducted in Pakistan, Turkey and Nigeria which showed higher leak rates in emergency cases. [10,11,25]

ASA class was found to be highly related to development of AL; in patients with ASA ≥3 about 42% of them developed AL whereas only 7% in those with ASA < 3. This finding is consistent with other researches across the globe.[11,23]

Intra-operative blood transfusion is also related to increased AL rate with transfusion causing altered haemostatic balance affecting immunity; AL occurred in about 32% of those transfused intraoperatively whereas only 7.5% developed AL among those not transfused. This is in line with many other researches which found intra-operative transfusion as a risk factor for AL.[10,26–28]

.Among the cases who developed AL 11 (65%) died while 6(35%) discharged improved. Mortality rate in patients with AL was higher than most other reported rates.[10,11].This might reflect on the low quality of perioperative care at the health facilities.

Mortality rate in those leaks detected within the first five post operative days was 40% while it was 75% in those detected after the fifth day. It appears those detected early showed better outcome.

The mortality rate of Al leak appears to be high 9(82%) among those operated by surgical residents compared to those operated by consultants which is 2(33%). This is similar with several studies which attributes a poor surgical skill to high AL.[29]

Limitations

As a retrospective cross sectional study, cause and effect cannot be established. Missing relevant data in the records and difficulty to retrieve charts has resulted in a response rate of 70%. The study involved only two hospitals in the capital and cannot be generalized to the country.

Conclusions

In our review, prevalence of anastomotic leak is slightly higher than most reports. Emergency presentation, those transfused intra-operatively and having higher ASA class were associated to anastomotic leak. Early detection of AL have also better outcome.

Recommendations

Identification and modification of risk factors especially in elective settings; optimal preoperative care, better operative techniques, and early identification of leaks using clinical signs coupled with biochemical markers are of paramount importance in reducing anastomosis leak. Moreover guidelines that prevent, detect and prompt an urgent management of anastomosis leak should be introduced and ensure that it is strictly adhered by all operating surgeons.

The need to have proper documentation at all levels is also critical for any organization that works to improve quality of care and health care outcomes. It's also our recommendation that further prospective researches on risk factors and interventions be conducted be done.

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