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Post Right Hemicolectomy Anastomotic Leak, the Rate, and the Related Risk Factors: A Descriptive Study

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Abstract **Original Research Article**

***Backgrounds*:** Colon cancer is usually treated by colon resection and bowel anastomosis. Right hemicolectomy is the main stay treatment of right sided colon cancer. Because the anastomotic leak (AL) post right hemicolectomy carries a significant morbidity and mortality, we evaluated the rate of this complication and the related risk factors. ***Methodology*:** (653) patients who underwent right hemicolectomy in our general surgery department at Jordanian Royal Medical Services between July 2017 and February 2023 enrolled in this retrospective descriptive study. The follow-up period was from two weeks to 45 days. ***Results*:** Of 653 patients who had a right hemicolectomy (42.7% male, ages from 24-71 years), emergency surgery 176 (27%). 248 (38.0%) had laparoscopic resection (5% conversion rate) and 405 (62%) underwent open surgery. 119 (18.22%) of all patients got a hand-sewn anastomosis, whereas 534 (81.77%) received stapled ones. 12 (1.83%) patients got a protective ileostomy and were excluded from other calculations, so the final number of patients was 641. The overall leakage rate was 2.2% (n=14) with a postoperative mortality of 16 (2.5%) (4 of 16 patients with leakage, P=0.007). The occurrence of an AL after laparoscopic technique was in 5 patients (0.78%), open approach in 7 (1.1%), and after revisional surgeries was in two cases (0.3%), (P=0.064, 0.051. 0.015, respectively). AL was in 6 cases (0.9%) after hand-sewn and in 8 cases (1.24%) after staple ones (P=0.077, 0.069, respectively). In emergency cases the AL was in 9 cases (1.4%) while in elective ones was in 5 cases (0.78%) (P=0.034, 0.004, respectively). ***Conclusion*:** Good assessment of risk factors of this anastomotic leak may lead to a decrease in the rate of this leak especially in acute condition and therefore the morbidity rate, mortality rate, and improve the quality of health care which will be more cost effective.

Keywords: Right Hemicolectomy, Anastomotic Leak, Hand-Sewn, Stapled Anastomosis, Laparoscopic Technique.

INTRODUCTION

Worldwide colorectal cancer constitutes the 3rd most common cancer in men and 2nd in women with increase incidence of proximal colon cancer and decreasing the overall incidence of colorectal malignancies [1]. From this point due to the increasing of right sided of colon cancer in a constant rate (the occurrence rate approximately 35% of all colorectal malignancies) the commonest procedure in colorectal cancers is right hemicolectomy [2]. Resection and primary anastomosis to restoration of bowel continuity in colon surgery is the cornerstone for treatment, but anastomotic leak (AL) post this surgery is the most common serious complication with increasing morbidity and mortality then may affecting the oncologic and functional outcomes [3]. The leak rate from ileocolonic anastomosis is around (0.02 to 4%) [4]. Possible risk factors of AL are multiple depending on tumor and patient characteristics, site of anastomosis which is of high rate of leak in the right side, and load of cases. These risk factors as follows: co-morbidity, higher American Society of Anesthesiologists (ASA) fitness grade, stage of disease, type of operation, emergency surgery and intraoperative complications, and hospital procedural high volume [5]. So, the AL rate and the related risk factors will be discussed in this study.

MATERIALS AND METHODS

(653) patients who underwent right hemicolectomy in our general surgery department at Jordanian Royal Medical Services between July 2017 and February 2023 enrolled in this retrospective

descriptive study. The follow-up period from two weeks to 45 days post right hemicolectomies. The data collected from computerized medical files of these patients by highly qualified doctors and expert nurses. The collected data of laboratory results, medical notes, and histopathology reports of these patients were analyzed and put into tables. The parameters of analysis focused on sex, age, indication for surgery, surgical approach, the anastomotic leak rate, the risk factors of this leak, technique of anastomosis, occurrence of AL, need for ileostomy, lymph node stage (N), postoperative revisional surgery, the various morbidities post this leak, and the effect of this on the survival (cancer specific and overall).

The Clavien- Dindo classification (grade 0 to 5) was used to categorize the postoperative morbidity [6]. TNM classification was used for lymph nodes classification [7], and the ASA score was used for the pre-operative health status evaluation [8].

The stapled anastomosis was mostly created extra-corporally, unisoperistaltic and side-to-side using the Medtronic Signia stapler with a violet cartridge (60 mm), whereas the hand-sewn ones were sutured isoperistaltic, in a single layer with a seromuscular running Monosyn suture.

Exclusion criteria those with history of steroid intake, on anticoagulation therapy, on immunosuppressive therapy, and those who underwent protective ileostomy.

Statistical Analysis

Regarding the data analysis: we used the SPSS version 26 to analyze the data, most of the data were presented in the form of tabulated comparative statistics. The numbers, the percentages, and the mean values were generated from the demographic and categorical data. The Comparison between these data (N (%), mean values) was done by chi-square test. P-value < 0.05 was considered statistically significant.

Ethical Committee: The ethical committee approval was gained from our Royal Medical Services institution for publication of this study.

RESULTS

653 patients underwent a right hemicolectomy. Regarding the demographic data the number of males was 279 (42.7%), females were 374 (57.3%), ages from 24 to 71 years, emergency surgery 176 (27%), while the elective surgeries were 477 (73%), 248 (38.0%) had laparoscopic resection (5% conversion rate) and 405 (62%) underwent open surgery, 119 (18.22%) of all patients got a hand-sewn anastomosis, whereas 534 (81.77%) received stapled ones. All percentages were calculated regarding the total number of patients (653). P value <0.05 was statistically significant. Table1.

Table 1: The Demographic Data Regarding the Indication of Surgery

Variables	Emergency surgery\N*\%®	Elective surgery\N\%	P-value
Males	82\12.55%	197\30.16%	0.066
Females	94\14.4%	280\42.88%	0.053
Age (24-50 years)	75\11.5%	209\32%	0.002
Age (51-71 years)	101\15.5%	268\41%	0.047
Laparoscopic technique	76\11.64%	172\26.33%	0.022
Open approach	100\15.3%	305\46.7%	0.009
Stapled anastomosis	128\19.6%	406\62.17%	0.036
Hand sewn anastomosis	48\7.35%	71\10.87%	0.027

N*: Number of patients. %®: percentage of patients regarding the total number of patients (653).

Concerning the categorical data 12 (1.83%) patients got a protective ileostomy and were excluded from other calculations, so the final number of patients was 641.

The overall leakage rate was 2.2% (n=14) with a postoperative mortality of 16 (2.5%) (4 of 16 patients with leakage). The occurrence of an AL after laparoscopic technique was in 5 patients (0.78%), open approach in 7 (1.1%), and after revisional surgeries was in two cases (0.3%). AL was in 6 cases (0.9%) after hand-sewn and in 8 cases (1.24%) after staple ones (P=0.077). In emergency cases the AL was in 9 cases (1.4%) while in elective ones was in 5 cases (0.78%). The percentages were estimated in relation to the total number of patients who underwent ileocolic anastomosis without protective ileostomy (641). P value <0.05 was statistically significant. Table 2.

Table 2: The Categorical Data in Relation to the Anastomotic Leak

Risk factors	With leak\N*\%®	No leak\N\%	P-value
Emergency surgery	9\1.4%	167\26%	0.034
Elective surgery	5\0.78%	472\73.6%	0.004
Laparoscopic technique	5\0.78%	243\37.9%	0.064
Open approach	7\1.1%	398\62%	0.051

Risk factors	With leak\N*\%®	No leak\N\%	P-value
Stapled anastomosis	8\1.24%	526\82%	0.069
Hand sewn anastomosis	6\0.9%	113\17.62%	0.077
Revisional surgeries	2\0.3%	27\4.2%	0.015
Pos-operative mortality	4\0.62%	12\1.87%	0.007

N*: number of patients. %®: percentage of patients regarding the total number of patients without ileostomy (641).

The AL in different types of lymph node enlargement according to TNM classification, due to postoperative morbidities after categorizing by the Clavien- Dindo classification, and ASA scoring was calculated in relation to the total number of patients (641) without terminal ileostomy and put in table 3. P value < 0.05 was considered statistically significant.

Table 3: The Relationship between AL and ASA Scores, Lymphnodes Status, and Postoperative Morbidity

ASA score	ASA1	ASA2	ASA3	ASA4	ASA5	P-value			
Leak\N*\%®	1\0.16%	4\0.6%	6\0.9%	2\0.3%	1\0.2%	0.012			
No leak\N\%	31\4.8%	293\46%	236\37%	53\8%	14\2.2%	0.008			
Postoperative morbidity (Clavien-Dindo)	0	1	2	3a	3b	4a	4b	5	P-value
Leak\N\%	0\0%	0\0%	1\0.16%	2\0.3%	5\0.78%	4\0.6%	2\0.3%	0\0%	0.03
No leak\N\%	314\49%	117\18%	95\15%	27\4.2%	38\6%	19\3%	15\2%	2\0.3%	0.01
Lymphnode status (TNM)	N0	N1	N2	N3	N4	P-value			
Leak\N\%	6\0.9%	3\0.47%	4\0.6%	0\0%	1\0.16	0.042			
No leak\N\%	548\85.5%	29\4.5%	41\6.4%	5\0.78%	4\0.6%	0.029			

N*: number of patients. %®: percentage of patients.

DISCUSSION

Comparative data from demographic and categorical variables in our study reported no significant differences in gender variable while there were significant differences in the type of surgical approach (laparoscopic or open), ages, and type anastomotic technique (stapled or hand sewn) in relation to the indication of surgery (emergency or elective). On the other hand, regarding the AL there were no significant difference in the type of surgical approach and the type of anastomotic technique, while the obvious differences were seen in the indication of surgery, revisional surgeries, post-operative mortality, ASA score health status, post-operative morbidity factors, and lymphnodes status. The AL rate was (2.2%).

The AL rate in our study is consistent with most literatures and dependent on same risk factors [9], but some articles reported that the male sex affect the AL and the minimally invasive surgery (laparoscopic technique) was protective [10]. While the others concluded that laparoscopic approach is associated with increased risk of anastomotic leakage [11].

Types of anastomotic techniques play a role in leakage rate. Stapled ileocolonic reconstruction associated with better outcomes and fewer minor complications in comparison to the sutured anastomotic technique [12, 13]. In stapled anastomosis, the end to side configuration decreases the incidence of leakage more than other types of stapled anastomosis [14]. On the contrast some literatures reported the fewer incidence of AL in end-to-end stapled anastomosis [15]. In our study there is no relation between the type of anastomosis and the incidence of leak.

Lymphnodes status could affect the AL rate as we noticed in our study. So, some articles support the complete retrieval of lymph nodes especially in locally advanced colon cancer (T3\T4) [16]. Others reported no obvious disadvantages, or considerable side effects, and the complication rates were not increased in addition to that the radical lymph node dissection in colon cancer may improve survival [17]. On the other side, the quality of evidence is limited and does not consistently support the superiority of the complete lymphnodes dissection in improving oncologic outcomes [18].

Other risk factors that may play a role in increasing the anastomotic leakage could be the perioperative blood transfusion and the experience of the surgeon [19]. And, the arterial hypertension, and conversion to open surgery post laparoscopic approach also within the risk factors [20].

Nutritional status preoperatively can't be missed as an independent risk factor for anastomotic leak in right colectomy beside the stapler use which were documented in some literature [21].

CONCLUSION

The AL rate in our study is consistent with most literatures, but the etiology of leak is multifactorial and affected by multiple risk factors, so good assessment of these risk factors may lead to a decrease in the rate of this leak especially in acute condition and therefore the morbidity rate, mortality rate, and improve the quality of

health care which will be more cost effective. The AL is not related to the surgical approach or the anastomotic technique.

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